The Communicator

September—October 2024

The Bi-monthly Journal of Surrey Amateur Radio Communications

PUBLICATION CONTACTS

COMMUNICATOR & BLOG EDITOR John Schouten VE7TI
communicator at ve7sar.net

SARC TELEPHONE 604-657-8753

CORRESPONDENCE 14689 - 72A Ave,
Surrey, BC V3S 9L8
SARC at ve7sar.net

CONTRIBUTING EDITORS John Brodie VA7XB
Kevin McQuiggin VE7ZD/KN7Q

The Communicator is a free electronic periodical published by Surrey Amateur Radio Communications in Surrey, B.C., Canada.

Our article reprint policy is on page 117

Issues appear bi-monthly, on odd-numbered months, for area Amateur Radio operators and beyond, to enhance the exchange of information and to promote ham radio activity.

Contributions of articles and photos are welcome.

During non-publication months we encourage you to visit the Digital Communicator at **ve7sar.blogspot.ca**, which includes recent news, past issues of ***The Communicator***, our history, photos, videos and other information.

To subscribe, unsubscribe or change your address for e-mail delivery of this electronic journal, notify **communicator @ ve7sar.net**

If you find ***The Communicator*** worthwhile, regular readers who are not SARC members are invited to contribute a donation towards our Field Day fund by etransfer to payments@ve7sar.net or via PayPal.

SARC maintains a website at **www.ve7sar.net**

DEPARTMENTS

The rest of the story **4**

Marlon Brando's ecological dream **9**

News you can lose —Ham humour **13**

Radio ramblings **15**

Surrey, BC summer high school course **26**

Oscilloscope clock project **36**

iCOM SIG **39**

HamClock Webserver on a Raspberry Pi Zero **46**

Pititico QRP transceiver project **55**

Broadband 100W linear amplifier project **64**

AREDN on Vancouver Island **72**

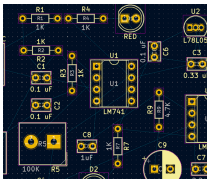
Issue columnists **83 - 97**

Back to basics **98**

SARC & SEPAR news **96 - 118**

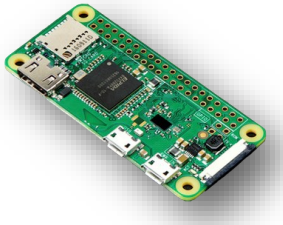
QRT **120**

IN THIS ISSUE



Kevin's Radio Ramblings with Part 3 of the CW decoder project

The July RF Summer School in Surrey, BC



We welcome a new contributor, Adam VE7ZAL, with his easy Raspberry Pi Zero HamClock webserver project.

...and so much more!

QSK?

-- ... -.-

...from the Editor's Shack

Do you have a photo or bit of Ham news to share? An Interesting link?

Something to sell or something you are looking for?
eMail it to ***communicator at ve7sar.net*** *for inclusion in this publication.*

Here's another Communicator for you and I think it is one of our best and most diverse issues to date. I would be very surprised if you did not find something in these pages that does not want to make you turn on your rig, plug in that soldering iron or experiment in some way.

You will read about our July high school course and a profile of a new ham who managed to get approval from his reluctant school board to launch this program that, in the end, resulted in 21 newly certified Canadian hams.

Adam also provided an article in this issue that leads you step-by-step installing HamClock onto an inexpensive Pi Zero W. This little device can run on your Wi-Fi system and only needs USB power to provide HamClock on any Wi-Fi device on your network. I was intrigued enough to try it myself and it works as well as my full-size Pi-3 device (which I can now devote to another project).

Adam also got me interested in 3D printing to the point that I invested in my own unit. I've been printing away madly, for amateur radio, my wife's sewing hobby and for my grandkids. It has intrigued me enough that the next Communicator will feature some of the great and useful things that you can make.

Enjoy the last couple of weeks of summer, see you next issue.

73,

~ John VE7TI, Editor
communicator@ve7sar.net

This Month's Cover…

Here are the students who devoted a month of their summer break to take an RF Communications course. The course provided an opportunity to write the Canadian Amateur Radio certification—with tremendous results. A full report starts on page 26.

It is hard to fail,
but it is worse never to have tried to succeed.—*Theodore Roosevelt*

On the Web

ve7sar.net

Between Communicators, watch your e-mail for news, announcements of Amateur Radio events, monthly meetings and training opportunities.

Click the links below to follow our presence on the web and social media:

SARC Blog
ve7sar.blogspot.ca

Twitter
@ve7sar

FaceBook
SurreyAmateurRadio

Our YouTube Channel
SurreyARC

SARC Photo Albums
Web Albums
or
tinyurl.com/SARCphoto

The Rest Of The Story…

Oliver Heaviside

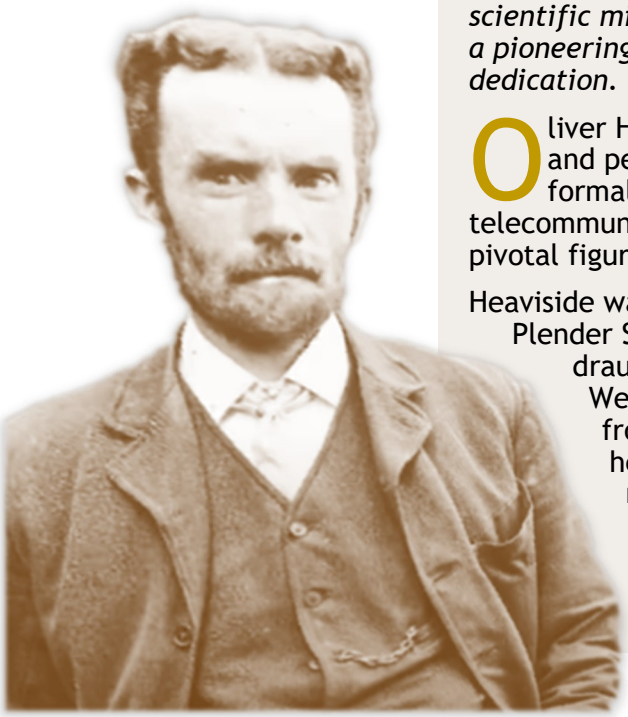
Another look at a pioneer and signal propagation along transmission lines

Oliver Heaviside is a figure of immense significance in the realm of physics, best known for predicting the existence of the ionosphere—a conductive layer in the upper atmosphere that reflects radio waves, facilitating long-distance wireless communication. He was a man born in the mid-Victorian times of 1850, into poverty at a low social and economic level. With no formal education after the age of 16, he eventually came to be accepted as the intellectual equal of the finest scientific minds of the day. Heaviside's journey from a telegrapher to a pioneering physicist is a testament to his remarkable intellect and dedication.

Oliver Heaviside's life and work exemplify the power of intellect and perseverance. Despite his humble beginnings and lack of formal education, Heaviside's contributions to science and telecommunications have left an enduring legacy, making him a pivotal figure in the history of physics and engineering.

Heaviside was born in Camden Town, London, at 55 Kings Street (now Plender Street), the youngest of three children of Thomas, a draughtsman and wood engraver, and Rachel Elizabeth (née West). He was a short and red-headed child, and suffered from scarlet fever when young, which left him with a hearing impairment. A small legacy enabled the family to move to a better part of Camden when he was thirteen and he was sent to Camden House Grammar School. He was a good student, placing fifth out of five hundred students in 1865, but his parents could not keep him at

Oliver Heaviside



school after he was 16, so he continued studying for a year by himself and had no further formal education.

Heaviside had few privileges, but he did have one stroke of luck. He took his first job at the age of 19 as a telegrapher with the Danish Telegraph Company. Heaviside's uncle by marriage was Sir Charles Wheatstone (1802–1875), an internationally celebrated expert in telegraphy and electromagnetism, and the original co-inventor of the first commercially successful telegraph in the mid-1830s. Wheatstone took a strong interest in his nephew's education and in 1867 sent him north to work with his older brother Arthur Wheatstone, who was managing one of Charles' telegraph companies in Newcastle-upon-Tyne. Subsequently, and as a result of an inability to continue as a telegrapher due to his hearing impairment, Heaviside learned that the company was laying a cable from Newcastle to Denmark using British contractors, and he became an electrician.

Undeterred, he turned his attention to studying electricity and telecommunications independently. By the age of 22 he published an article in the prestigious Philosophical Magazine on 'The Best Arrangement of Wheatstone's Bridge for measuring a Given Resistance with a Given Galvanometer and Battery which received positive comments from physicists who had unsuccessfully tried to solve this algebraic problem, including Sir William Thomson, to whom he gave a copy of the paper, and James Clerk Maxwell. When he published an article on the duplex method of using a telegraph cable, he poked fun at R. S. Culley, the engineer in chief of the Post Office telegraph system, who had been dismissing duplex as impractical.

Later in 1873 his application to join the Society of Telegraph Engineers was turned down with the comment that "they didn't want telegraph clerks". This riled Heaviside, who asked Thomson to sponsor him, and along with support of the society's president he was admitted "despite the P.O. snobs".

He was by now well versed in the practical side of telegraphy. His time as a telegrapher would be his first and only formal job. Heaviside was never married. He was a recluse. It seemed that he made the choice to dedicate his life to mathematics and his first task was to understand the new work of Maxwell. Despite lacking formal scientific training, Heaviside made significant contributions that would reshape the field.

FOCUS BOX

In 1923, Heaviside spoke of his youth, and reminisced about his first look at the great treatise of Maxwell: "When I was a young man, up to that point there was no comprehensive theory, just a few scraps. When I first saw on the table in the library, the work that had just been published in 1873. I browsed through it and was astonished. I saw that it was great, greater and greatest, with prodigious possibilities in its power. I was determined to master the book and set to work. I was very ignorant. I had no knowledge of mathematical analysis and thus my work was laid out.

https://youtu.be/wyS2aNIKxmQ

Electromagnetic Theory and the Ionosphere

Heaviside's magnum opus, "Electromagnetic Theory" (1893-1912), postulated that an electric charge would increase in mass as its velocity increased, anticipating aspects of

(Continued on page 7)

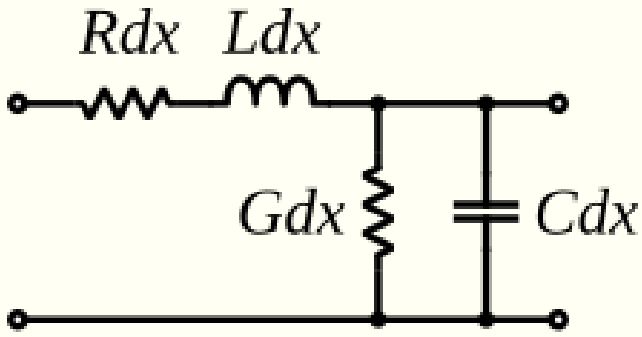
The Telegrapher's Equations

The telegrapher's equations (or just telegraph equations) are a set of two coupled, linear equations that predict the voltage and current distributions on a linear electrical transmission line. The equations are important because they allow transmission lines to be analyzed using circuit theory. The equations and their solutions are applicable from 0 Hz (i.e. direct current) to frequencies at which the transmission line structure can support higher order non-TEM modes. The equations can be expressed in both the time domain and the frequency domain. In the time domain the independent variables are distance and time. The resulting time domain equations are partial differential equations of both time and distance. In the frequency domain the independent variables are distance

The frequency domain variables can be taken as the Laplace transform or Fourier transform of the time domain variables or they can be taken to be phasors. The resulting frequency domain equations are ordinary differential equations of distance. An advantage of the frequency domain approach is that differential operators in the time domain become algebraic operations in frequency domain.

The equations come from Oliver Heaviside who developed the transmission line model starting with an August 1876 paper, On the Extra Current. The model demonstrates that the electromagnetic waves can be reflected on the wire, and that wave patterns can form along the line. Originally developed to describe telegraph wires, the theory can also be applied to radio frequency conductors, audio frequency (such as telephone lines), low frequency (such as power lines), and pulses of direct current.

The telegrapher's equations, like all other equations describing electrical phenomena, result from Maxwell's equations. In a more



practical approach, one assumes that the conductors are composed of an infinite series of two-port elementary components, each representing an infinitesimally short segment of the transmission line:

The distributed resistance R_{dx} of the conductors is represented by a series resistor (expressed in ohms per unit length). In practical conductors, at higher frequencies, R increases approximately proportional to the square root of frequency due to the skin effect.

The distributed inductance L_{dx} (due to the magnetic field around the wires, self-inductance, etc.) is represented by a series inductor (henries per unit length).

The capacitance C_{dx} between the two conductors is represented by a shunt capacitor C farads per unit length).

The conductance G_{dx} of the dielectric material separating the two conductors is represented by a shunt resistor between the signal wire and the return wire (siemens per unit length).

~ https://en.wikipedia.org/wiki/Telegrapher%27s_equations

(Continued from page 5)

Einstein's special theory of relativity. He also theorized the existence of a conductive layer in the atmosphere—later known as the Kennelly-Heaviside layer—that allows radio waves to follow the Earth's curvature instead of travelling off into space. This prediction, made in 1902, was crucial for the development of wireless telegraphy.

Heaviside's contributions to electromagnetic theory and telecommunications were monumental. His insights into signal propagation, the nature of electrical transmission, and the prediction of the ionosphere laid the groundwork for modern telecommunications. Heaviside's work continues to influence the field, and his equations remain a fundamental part of electrical engineering education.

Contributions to Telegraphy and Electrical Transmission

In his seminal work "Electrical Papers" (1892), Heaviside tackled theoretical problems in telegraphy and electrical transmission. He employed an innovative method called operational calculus, now known as the Laplace transform, to study transient currents in networks.

This mathematical tool allowed Heaviside to solve complex differential equations and analyze electrical circuits more effectively.

One of Heaviside's key contributions was his work on the theory of the telephone, which made long-distance service practical. His insights into the nature of electrical transmission and signal propagation were crucial in overcoming the challenges of maintaining signal integrity over long distances.

The Telegrapher's Equation

In an 1876 paper titled "On the Extra Current," published in the Philosophical Magazine, Heaviside introduced the telegrapher's equation. This groundbreaking work described how signals propagate through transmission lines, forever changing our understanding of electrical transmission.

Heaviside's work built on the foundations laid by William Thomson (later Lord Kelvin) in 1855. Thomson had used Fourier's heat equation to explain signal propagation in the first transatlantic telegraph cable. Fourier's work on heat diffusion showed that signals with higher frequencies travel and attenuate faster, a process known as dispersion.

Fourier's Influence

Joseph Fourier's 1822 book "The Analytical Theory of Heat" revolutionized the modelling of physical systems. Fourier demonstrated that heat flows from hotter regions to cooler regions, with the rate of flow proportional to the temperature difference. He introduced the heat equation, which describes this diffusion process.

Fourier's breakthrough was his realization that any arbitrary function could be represented as a sum of sinusoidal waves. By finding the sine waves that make up a signal, Fourier showed that the solution to the heat equation could be obtained by summing the scaled-down versions of these waves. This principle was fundamental in understanding signal propagation in telegraphy.

Thomson's Model

In 1855, Thomson proposed a model explaining signal propagation through electrical cables, which led to the first telegraph connection between America and Great Britain. Thomson's model treated the cable as an infinite series of resistances and capacitances, leading to the discovery that voltage and current propagate according to the heat equation.

Thomson's analysis, although initially not widely accepted, predicted the problem of

dispersion in long cables. Higher frequencies travel and attenuate faster than lower frequencies, causing signals to spread out over long distances. This phenomenon, known as dispersion, plagued early telegraph systems, including the first transatlantic cable.

Heaviside's Breakthrough

Heaviside built on Thomson's work by incorporating the concept of inductance, which he termed in 1876. Inductance creates a voltage drop proportional to the rate of change of current, as opposed to just the current itself. This subtle difference introduced wave-like properties to signal propagation, allowing for a more accurate and comprehensive model.

Heaviside's telegrapher's equations combined both diffusion and wave propagation, providing a robust theoretical framework that remains relevant in modern telecommunications. His work demonstrated that signal propagation in transmission lines involves both diffusion, akin to heat flow, and wave propagation, offering a complete picture of how electrical signals travel.

Electromagnetic terms

Heaviside coined the following terms of art in electromagnetic theory:

- admittance (reciprocal of impedance) (December 1887);
- elastance (reciprocal of permittance, reciprocal of capacitance) (1886);
- conductance (real part of admittance, reciprocal of resistance) (September 1885);
- electret for the electric analogue of a permanent magnet, or, in other words, any substance that exhibits a quasi-permanent electric polarization (e.g. ferroelectric);
- impedance (July 1886);
- inductance (February 1886);
- permeability (September 1885);
- permittance (now called capacitance) and permittivity (June 1887);
- reluctance (May 1888)

An that is more of his story.

~


Internet 'may be just a passing fad as millions give up on it'

Marlon Brando's Ecological Dream:

The Legacy of Tetiaroa

based on an article by: PAT MORRISON

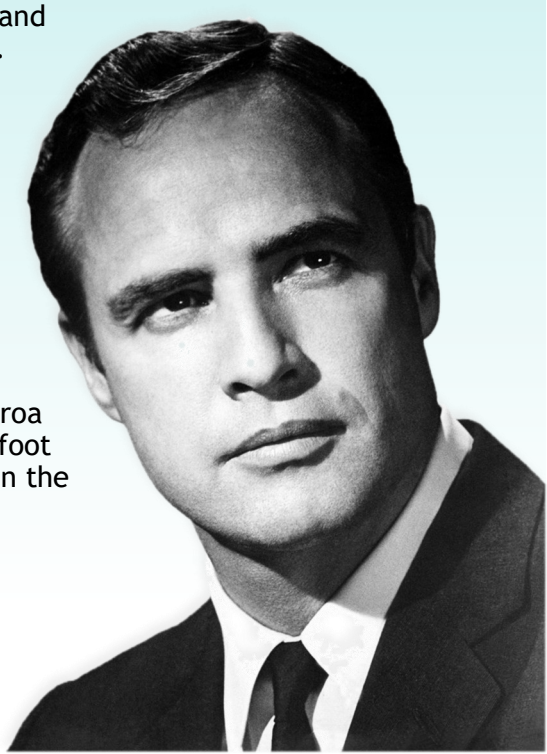
You may be asking: "What does this have to do with Amateur Radio?" Please stand by… Marlon Brando, a name synonymous with cinematic brilliance, was also a man with a deep, almost mystical connection to nature. This connection found its most profound expression in Tetiaroa, a Tahitian atoll that Brando purchased in the 1960s. Known for his desire to protect his private life, Brando nevertheless opened up about his vision for Tetiaroa, a vision that was as paradoxical and complex as the man himself.

In the late 1990s, Brando confided in a close friend about his aspirations for Tetiaroa. He dreamt of transforming the atoll into more than just an eco-friendly resort; he envisioned it as a nature preserve, an open-air scientific research lab, and a "university of the sea." His goal was to create a place that served both its immediate environment and the broader planet, blending luxury with ecological responsibility.

This vision may seem contradictory—after all, an eco-resort is inherently paradoxical, given that any human activity leaves an environmental footprint. Yet, Brando's vision was driven by a deep understanding of nature and a commitment to sustainability, even if it meant embracing these contradictions.

As it turns out, Brando's dream has largely been realized. The Brando, the high-end private resort that bears his name, is a testament to his foresight. Located in the South Pacific, the resort is not just a luxurious escape for the wealthy; it's also a hub for cutting-edge environmental technology, much of which Brando envisioned decades ago.

This year marks what would have been Brando's 100th birthday, and 20 years since his passing. Even as his physical presence faded, Tetiaroa remained a constant in his thoughts—a place where he felt most himself, a place where he was "just a visitor," much like the countless others who had come before him.



Brando's journey to Tetiaroa began long before he set foot on its sands. Growing up in the

Martin Brandeaux WA6RBU

Better known as Marlon Brando FO8GJ

Marlon Brando was indeed involved with amateur radio, which was one of his lesser-known passions. He was a licensed and very active ham radio operator, and his primary call sign was FO8GJ. Brando became interested in amateur radio during the 1950s, a hobby that allowed him to communicate with people around the world, often from his home in Tetiaroa, French Polynesia.

He enjoyed the anonymity that amateur radio provided, even using the name Martin Brandeau and call WA6RBU on the air to mask his identity. This allowed him to have conversations without the interference of his celebrity status. It was a way for him to connect with people on a more personal level, away from the limelight of Hollywood.

Brando's radio operations from Tetiaroa, where he had set up a station, were particularly significant. Operating under the French Polynesian call sign, he communicated with other amateur radio enthusiasts worldwide, often discussing topics ranging from technical radio matters to the beauty of Polynesian culture.

For Brando, amateur radio was more than just a hobby; it was a means of escape and a way to explore his curiosity about the world. Despite his reclusive nature, he maintained this connection with the global community through his radio, making it a unique part of his life outside of acting.

harsh winters of Nebraska and Illinois, he was drawn to the pages of National Geographic, where he first encountered the Polynesian culture that would captivate him for life.

This fascination eventually led him to Tahiti in 1961, where he was filming "Mutiny on the Bounty." It was here that he first visited Tetiaroa, a place that would become his sanctuary and, eventually, his legacy.

Describing Tetiaroa is an exercise in superlatives. The atoll, with its opalescent lagoon and gentle winds, is nothing short of magical. Brando himself was deeply moved by its beauty, recalling how he once slept on the beach, using a coconut for a pillow, and felt a profound connection to the island. He quickly realized that he did not own Tetiaroa; the island owned him, a sentiment that brought him deep comfort. Within a few years, Marlon had started a Tahitian family and managed to buy Tetiaroa, the wild and sacred atoll about 40 miles from the capital city of Papeete, made up of a dozen small islands — *motus* — encircling an opalescent lagoon.

Today, what was once Brando's private refuge is now a destination for those who can afford it, including celebrities like the Obamas, Beyoncé, and Pippa Middleton. But while the Brando resort offers luxury and

Marlon Brando's bungalow and amateur radio station on Tetiaroa, circa 1979. (Images Press / Getty Images)

privacy to its guests, it is the backstage operations that would have mattered most to Brando.

Before his death, Brando collaborated with Richard Bailey, CEO of Pacific Beachcomber, to ensure that Tetiaroa would remain true to his vision. The resort operates under a 99-year lease, with most of the atoll preserved from any construction. Since its opening in 2014, the Brando has successfully combined tranquility with cutting-edge green technology, making it a model of sustainability.

Among the resort's most impressive achievements is its use of a 980 foot pipeline to provide seawater air conditioning (SWAC), a system that Brando had long envisioned. The SWAC system uses cold seawater from deep in the ocean to provide air conditioning for the resort, with minimal environmental impact. This technology is not only efficient but also sustainable, making it a key component of the resort's eco-friendly operations.

Brando's commitment to sustainability extended beyond technology. The Tetiaroa Society, another of his initiatives, works to protect the atoll's unique ecosystem. This includes efforts to eradicate invasive species and protect native wildlife, such as the green sea turtles that now thrive on the island. The society also collaborates with researchers from around the world, furthering Brando's dream of Tetiaroa as a hub for scientific study.

Brando's love for Tetiaroa was deeply rooted in his appreciation for its isolation. He believed that the value of "less and less" was becoming increasingly important in a world of excess. This belief is reflected in the resort's operations, which prioritize the island's needs over those of its guests. For example, certain items, like bananas and Mylar balloons, are not available at the Brando, as they could pose a threat to the local ecosystem.

Marlon Brando's legacy is often associated with his groundbreaking work in film, but Tetiaroa stands as a testament to his lesser-known passion for the environment. In the end, it's likely that he would have been more proud of his work on Tetiaroa than his contributions to Hollywood. For Brando, Tetiaroa was more than just an island; it was a symbol of what could be achieved when one person commits to making a difference.

~

Page 12

News You Can't Lose

ISED gives advance notice of update of basic amateur radio exam questions

By: RADIO AMATEURS OF CANADA

On July 5, 2024, Innovation Science and Economic Development Canada (ISED) posted the following announcement on its website:

"Working with the Radio Amateurs of Canada (RAC), Innovation, Science and Economic Development Canada (ISED) plans to update the Basic Amateur Exam questions and answers in early 2025. An advance copy, in PDF format, will be posted in the coming months on our Downloads page so that instructors and examiners can update their material before the transition. After this update, ISED will perform a similar review of the Advanced Amateur Exam, with new exams expected after 2025."

As indicated in the announcement, this is the result of a RAC initiative – which was presented to ISED in 2022 – and over a year of hard work by the members of RAC's Examination Standards Committee (ESC). The final details of the update to the Basic Amateur Exam are being worked out now. ISED must put the completed draft of the Basic Question Bank through some internal processes before it can be published.

ISED will publish the new Basic Question Bank on its website several months before it is implemented to allow instructors, authors and candidates the opportunity to adjust to the changes. The existing Basic Question Bank will be used until the new bank is implemented sometime in 2025.

RAC's Examination Standards Committee is now working on recommendations for updates to the Advanced Question Bank.

You can see ISED's announcement at these links:

Amateur radio exam generator (canada.ca)

Accredited examiners (canada.ca)

~ Dave Goodwin VE3KG
Regulatory Affairs Officer
Radio Amateurs of/du Canada
regulatory@rac.ca

https://www.rac.ca/update-of-ised-review-of-basic-amateur-exam-questions/

Page 13—News You Can Lose

The Lighter Side of Amateur Radio

The ideal "Hamshack" format for contesting

STICKLEY, SK - From our Home Design correspondent

A reader recently wrote: *"I recently converted my hamshack with a setup that has turned out to be nothing short of a nightmare. My wife took up much of the room and in my corner the desk is too small to accommodate my station essentials, leaving me constantly juggling items and feeling cramped. The chair is equally disappointing – It rolls around and I'm constantly searching for my PTT foot pedal. The lighting is another major issue. The overhead fluorescent lights are harsh and create a glare on my computer screen, leading to frequent headaches and eye strain.*

The overall layout of the room is also problematic. The design means there's little privacy, and the constant noise from my wife's friends makes it difficult to concentrate. The temperature control is inconsistent, at times being too hot and others too cold, adding to the discomfort.

This hamshack setup is far from ideal and has significantly impacted my productivity and contesting success. Please give me some suggestions".

Our home design correspondent researched your problem, which is not unique. The answer to your problem is likely just steps down the hall. In a quirky yet functional setup, an amateur radio enthusiast has transformed his bathroom into a multi-purpose space that combines the elements of a traditional bathroom with a dedicated radio operating station.

Not a functional workspace...

Nice… but so 'old school'.

This unconventional arrangement features a desk integrated into the bathroom's layout, making it an intriguing and practical space for passionate ham radio operators who value efficiency and creativity.

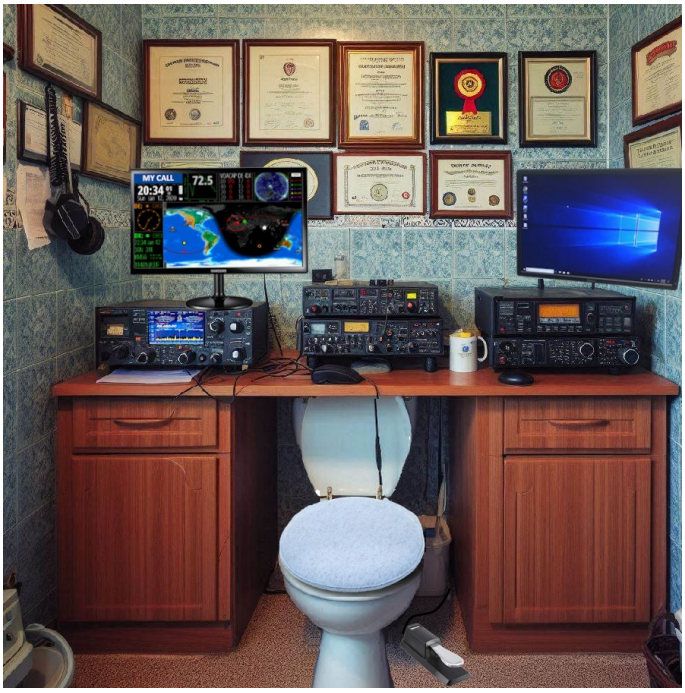
Suggested layout and features

Desk and Equipment: As always, the focal point of this setup is the desk, which is built into an alcove in the bathroom. The desk is equipped with an impressive assortment of amateur radio gear, including transceivers, feedlines, and other necessary equipment for operating a ham radio station.

Toilet Positioning: The toilet is situated right into the desk. This allows the operator to use the radio equipment while seated, and provides enough space for the operator to manage both personal and radio activities without moving from their spot.

Awards and Decorations: The walls around the desk are adorned with various award certificates, showcasing the operator's achievements and dedication to amateur radio. These accolades add a personal touch and a sense of pride to the space.

Coffee on the Desk: A cup of coffee sits on the desk, indicating that the operator spends significant time in this space, requiring the occasional caffeine boost to stay alert and focused during long sessions of uninterrupted radio contesting.



In pursuit of the perfect contesting shack…

No Chair: Interestingly, there is no traditional chair in this setup. The toilet itself serves as the seat, cleverly integrating the dual functionality of the space.

Practical Considerations: While perhaps unconventional, this setup is a testament to the dedication, creativity and adaptability of amateur radio enthusiasts. It maximizes the use of available space and ensures that the operator can enjoy the hobby at any time, even while attending to personal needs.

This unique arrangement might be particularly appealing to those with limited space, offering an innovative solution to the challenge of finding room for a dedicated radio station.

Whether for a first station or for the seasoned ham, we hope that this has provided some insight to resolve your comfort and space dilemma.

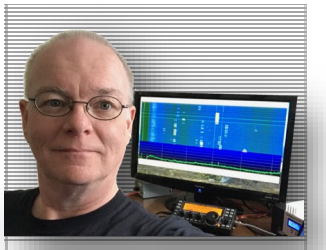
~

Radio Ramblings

The Easy CW Decoder Part III

Putting it into practise

by KEVIN McQUIGGIN VE7ZD / KN7Q



Kevin VE7ZD/KN7Q is active in EME, meteor scatter and much more. He lives on Vancouver Island

This month we will conclude our discussion of the CW decoder that we've been looking at in the last two issues of The Communicator [1]. This alternative approach to CW decoding uses "fuzzy" decoding: rather than using absolute time measurements to discern a dit from a dah, fuzzy decoding uses the average timing of recent code elements to make this decision. It's more effective than other more common methods. Fuzzy decoding accounts for inherent code speed variability and, as a bonus, allows code speed to be tracked automatically.

Two issues ago we covered the basics and developed a simple fuzzy decoding algorithm, and last issue we wrote some Arduino code to implement it [2] [3]. We also discussed a simple hardware interface using a straight key that can be used to test the Arduino code. CW decoding is quite a complex topic!

This issue we'll flesh out the hardware interface so that it can be connected to the audio output or "LINE OUT" connector on the back of your transceiver. You'll be able to tune in CW signals from the HF bands and have the Arduino decode them.

This issue I'll provide you with a schematic for the interface and a PCB (printed circuit board) that you can order from OSH Park [4] or another fabrication house if you want to build it yourself. If you don't want to order a PCB then you can use the schematic to "breadboard" the interface and experiment with it – and maybe even improve it. The Arduino firmware is already on GitHub [3].

Overview of the Interface

Let's take a high-level look at the hardware interface and then dive a bit deeper to look at the various blocks or stages of the interface.

Input to the interface will be an audio signal from your receiver; output will be a digital signal (stream of 0s and 1s) that represent the absence (0) or presence (1) of a filtered audio signal. This bit stream will represent the CW signal that will be decoded by the Arduino's firmware.

At a high level the interface looks like this:

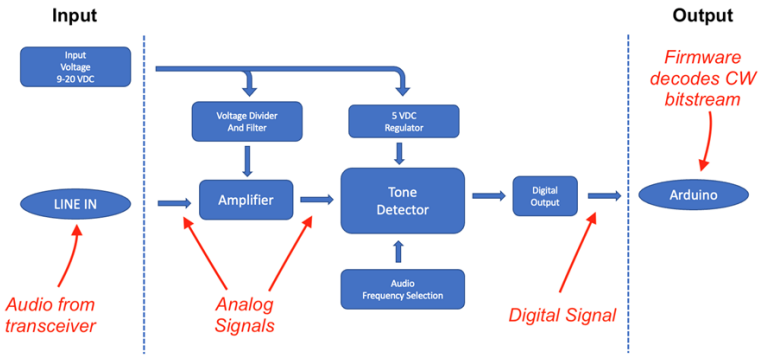


Figure 1 – Interface Block Diagram

Let's look at each of the subsystems in the figure:

A) Power:

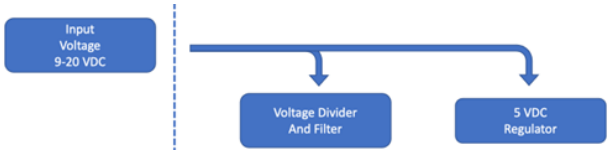


Figure 1A – Power Supply

DC input to the interface can range from 9 to 20 volts. The input voltage is filtered to remove any AC components. A voltage divider divides the input voltage in half for use by the signal amplifier.

The second part of the power subsystem uses a voltage regulator IC to generate a stable 5 volts for use by the tone detector chip.

B) Amplifier:

Figure 1B - Amplifier

This section uses an operational amplifier (opamp) IC (LM741) to filter and amplify the input audio signal from the transceiver. Passive filtering is used to provide some isolation of the signal from other signals or noise in the input audio passband. The gain of the amplifier is set by a 100K potentiometer, so the user can adjust this to suit the input audio level and the band conditions. Output of this subsystem goes to the tone detector.

C) Tone Detector:

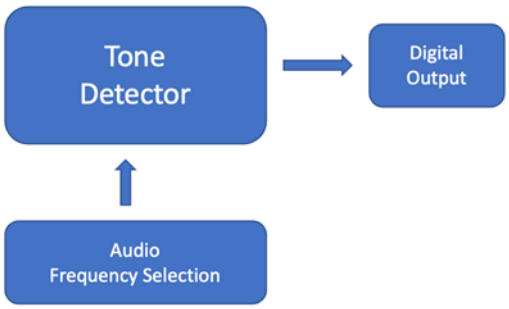


Figure 1C – Tone Detection

The tone detector uses an LM567 IC to detect a specific tone in the input signal and produce a '1' digital output when the tone is present. When the tone isn't present the IC generates '0' as output.

Supporting circuitry sets the specific frequency that the chip will detect and the bandwidth of the detection circuit.

The bandwidth is set to be quite narrow to provide good selectivity between signals in the audio input. The signal detection frequency is user settable using a 10K potentiometer. This will allow users to select one particular signal in their audio passband for decoding.

The tone detector generates a stream of 1s and 0s, and this digital output is passed to the attached Arduino where the firmware we discussed last issue reads the input stream, times the code elements and finally looks up the resulting CW symbols in its lookup table. Presto! The user sees the decoded CW.

That's how the interface works, in a nutshell.

A Quick Observation

I am not an electronics engineer, nor an expert at this stuff. The scope of my formal training includes what I learned in order to get my amateur radio certificates and some courses in digital electronics that I took in university.

I have found that the most important part of my training came from the experience that I gained from "tinkering" - building a bunch of projects from articles and kits, and failing with my own circuit designs for many years.

Failure is a great teacher. I'd design a circuit and build it, but it wouldn't work. I'd have to figure out why, but often I couldn't, so the non-functional gadget went on the shelf, or its parts got used in the next project. I kept at it for a few years, though, until with greater experience, my projects just somehow started to work. This was exciting, but I will always remember the hard slog that it took me to get to this point.

Since then, my designs almost always work, and if they don't then I usually have enough experience to figure out why not. If not, then I hit the (virtual) books and learn what went wrong.

The key observation here is that tinkering and experimentation, and most importantly an open mind and a willingness to read and learn, are key to success. You need to be willing to experiment and fail (maybe a lot!) before you are able to build up enough of a foundation to begin to really understand the subject that you are studying.

So don't worry if you think that you could never develop an interface such as this one yourself. Tinker and learn, persevere through failure, and you'll be writing the next article in The Communicator on your own circuitry or software!

The Schematic

No interface article would be complete without an impressive schematic diagram , so I will present it here in Figure 2 *[next page]*. The details are in the schematic for those with requisite experience, but if you're on the learning curve then you'll have all the foundational details you need to know from the block diagram discussion above.

The schematic includes some nice features like LEDs to show "power on" and track the bits being output to the Arduino. Let's dig into the schematic, just a bit.

Input voltage "Vin" at J1 can range from 9 to 20 volts DC. There are, in effect, two power supplies in the interface. It powers the input signal amplifier, and also the IC that does the tone detection.

For the input signal amplifier, Vin goes through the voltage divider at R1 and R2, dividing the input voltage by 2 (because R1 and R2 are equal in value). This is applied to the non-inverting input of the operational amplifier U1. The positive and negative supply inputs to U1 are tied to Vin and ground.

Vin also serves as the input to voltage regulator U2, generating a stable 5 VDC output. Input and output to the voltage

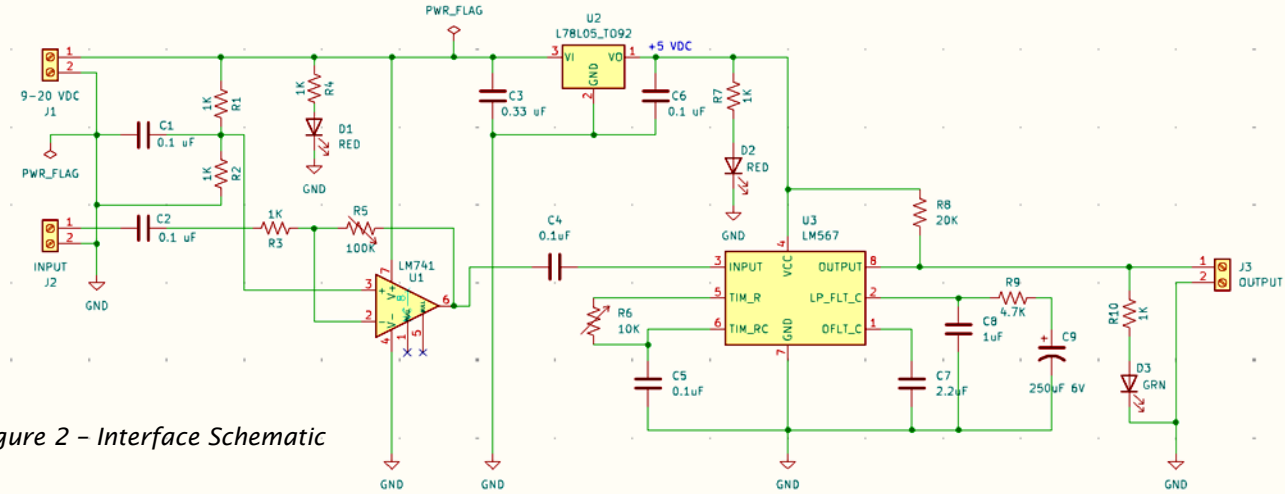


Figure 2 – Interface Schematic

regulator are filtered by capacitors C3 and C6 to ensure a stable 5 VDC output. The 5 VDC is used to power U3, the tone detector IC.

Two LEDs D1 and D2 (both red in colour) are used to give the user feedback that supply voltages are working.

The operational amplifier (opamp) is the very common LM741 IC. I used the datasheet for the IC and the referenced application notes to connect the opamp as a non-inverting amplifier. Pin 6 (the opamp's output) is fed back into the input through R5, and this sets the amplifier's output gain. R3 and the potentiometer R5 are used to set the gain of the amplifier. R5 should be mounted on the interface box so that the user has an input "volume control". He or she can set the gain of the LM741 to get good results from the tone decoder in the next stage of the circuit.

C2 and R3 help isolate the opamp from the input circuitry back in the transceiver and provide a bit of filtering. After the LM741 does its job, the output on pin 6 (an AC audio signal) gets passed to the next stage (the tone detector) through capacitor C4. DC signals get blocked by the capacitor, of course, so only the audio signal from the opamp is passed on. This goes into the input (pin 3) of the tone detector IC, an old-but-reliable LM567.

I reviewed the datasheet and application notes for the LM567 in detail as I really wanted to understand how the IC works. There are two important things that need to be set: the center frequency and the loop bandwidth.

The center frequency sets the frequency of the audio tone that you want to be decoded. It is set by the choice of R6 and C5, which connect to pins 5 and 6 of the IC. The application notes for the LM567 told me how to calculate the values (in ohms and microfarads) of these two components. I chose to use a 10K potentiometer for R5 to allow the user to select a particular CW signal in the filtered audio that is being presented as input to the LM567. 10K gives lots of flexibility to allow the user to select a single signal out of the many which may be in the audio passband.

This potentiometer should also be mounted on the front of the interface so that the user can "twist the knob" to select the right CW signal for decoding. In QRM, of course, there may be many signals in the audio passband so choosing only a single audio frequency for detection (by choosing a fixed resistor, for example) would be frustrating for the user. She or he would then have to tune the transceiver's VFO to get the desired signal into the detector. Better to be able to leave

the transceiver's VFO alone and fiddle with the two knobs on the interface box (gain and center frequency) to select the desired signal.

That takes care of the components that select the center frequency. The other value that needs to be set on the tone decoder is the loop bandwidth.

Loop bandwidth is also explained quite well on the LM567's datasheet and in the application notes. It sets the bandwidth of the detector. It's a bandpass filter and the loop bandwidth sets its width. You want the filter to be narrow, but not too narrow. Too wide a bandwidth will confuse the tone decoder as it will "hear" multiple signals at once. Too narrow a bandwidth will make setting of the center frequency (by twiddling the knob) very difficult.

I decided to set the loop bandwidth to a reasonably small value (it's measured in hertz) by using the datasheet to select values for C8, R9 and C9 that would fix the bandwidth at about 5 percent of the selected audio frequency. There are formulae for calculation of values for C8, R9 and C9 in the datasheet. A fixed bandwidth of about 10 to 50 Hz worked well when I breadboarded the circuit and ran some tests.

I also tried using a variable capacitor for C8 to allow the user to vary the loop bandwidth in real time. This third control (in addition to center frequency and gain) proved to increase the tuning complexity of the interface significantly. As all three settings (the center frequency, the gain and the loop bandwidth) are interrelated it became very, very difficult to get a CW signal tuned in for decoding.

Coordinating the three controls was like trying to keep all those plates spinning on poles in that old TV act, or juggling tennis balls while singing and using a hula-hoop. It was next to impossible, and definitely not fun. So I made the practical decision to fix the loop bandwidth to a small but not too small value. This worked well and I never looked back at the decision.

We are almost finished with discussing the schematic. The tone detector performs its function and generates a digital '0' when it does not detect an input signal at the selected frequency, and a '1' when a signal at the selected frequency is present. This output comes from pin 8 of the IC. Pin 8 is passed to J3 for output.

I also added an LED (D3) at pin 8 (the output pin) of the LM567 to show the user when the target CW signal is being decoded properly. D3 will blink on a '1' and turn off with a '0' output. In practical use, when a CW signal has been properly tuned in by the interface you will see D3 blinking in time with the CW that you hear from your radio.

Our Arduino running the firmware from last issue expects a digital input on (you'll recall) it's D2 input pin. So J3's data pin (pin 1) needs to go to a cable that goes to pin D2 of our Arduino. The other pin of J3 goes to ground. Once the cable is in place, start the Arduino, load the firmware from Part II, and you should start seeing decoded CW on your computer.

That's it for the circuit description.

Observations

I'll pause for a second to make a few observations. How did we make it to this end point?

In this project we started with a goal, and then thought about how we can design hardware and software to achieve it. We broke the problem down into a few parts. First, we devised a method (algorithm) that could receive 0s and 1s, with '0' representing "no tone" and '1' representing a tone.

This was still a "thought experiment" and we had a number of issues to resolve. How can we tell a dit from a dah? How can we

tell when we have received the last code element of a CW symbol? We decided to use a “fuzzy” approach and use the average duration of the last 16 code elements to help make the dot or dash decision. The end of a symbol would be detected after a longer period of silence (0s).

We conceptualized this idea, and then wrote some Arduino (essentially, C language) code to implement this algorithm. We tested the algorithm by connecting a CW key to the program’s input (through a simple interface using a single resistor) and were able to test and refine the program to allow it to copy and decode CW when we sent it manually on the attached straight key.

Importantly, only then (after the firmware was working with a straight key as input) did we turn to thinking about how to get audio from our transceiver into the Arduino. This is a separate problem. We had to design an interface circuit. Audio from the transceiver needs to be processed to produce a stream of 0s and 1s representing “tone present” and “no tone”.

This was another challenge. It required thinking about how to perform tone detection, signal conditioning, and power supplies that would be required.

Note how the target problem (decoding CW automatically) was broken into simpler steps. These steps were easier to solve, and could be solved in any order. We decided to start with the definition of the decoding algorithm, but just have easily could have started with the interface circuit. This method of “divide and conquer” works just as well for big problems as for simpler ones.

Datasheets

The importance of hardware datasheets cannot be underestimated. Datasheets describe each and every device (from a resistor to a connector to the most complex IC) and always provide an invaluable section called “Application Notes” where the manufacturer of the component or chip gives the reader some examples of how the device or IC is used in practise. Study these examples! You can use these circuits as-is if they meet your needs, or modify them through experimentation if the examples are too different from what you want to do with the device.

With the LM567 tone decoder I used an example of a DTMF decoder (detection of touch-tone telephone digits) presented in the application notes as the basis of our CW tone detection circuit.

The DTMF decoder in the example showed a set of 7 decoders wired in parallel to detect 12 DTMF codes (0 through 9, plus ‘*’ and “#”). This showed how to use the LM567, but it was overkill for what I needed! I just stripped out 6 of the 7 parallel circuits in the application note and built the circuit with one tone decoder section. Figure 3 shows the DTMF detector circuit from the application note. The subsection of the schematic that I used as the basis for single tone detection in our interface is circled in red.

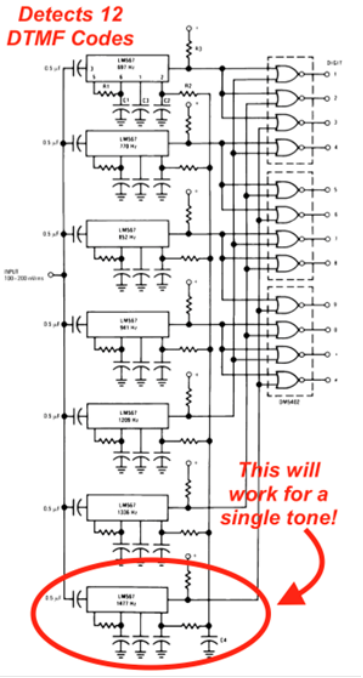


Figure 3 – LM567 DTMF Decoder Application Note

I'm sure that you can now appreciate the utility of these examples!

Datasheets for a resistor or capacitor will be only a couple of pages long, but those for more complex devices can run to dozens (or more) of pages. Microprocessor datasheets (like the one for the standard ATmega processors on Arduino boards) can be 300 pages or more in length! See [5].

You can find the datasheet for any device you are considering using on the Internet. Good sources for datasheets are the parts providers Digikey and Mouser, SnapEDA, and massive repositories such as AllDataSheet. Relevant URLs are:

- https://digikey.ca
- https://mouser.com
- https://snapeda.com
- https://alldatasheet.com

You can also get datasheets through popular "Maker" or hobbyist sites like:

- https://adafruit.com
- https://sparkfun.com

KiCAD: Executive Summary

I used KiCAD (pronounced "KEY CAD") to document the schematic for our decoder interface and design its printed circuit board (PCB). KiCAD will be the topic of a future column, but let's look at how the program works very briefly. It's worth learning and it's quite easy to use.

I have put the schematic of the interface and PCB up on GitHub at https://github.com/mcquiggi/CW-Decoder . The files are in KiCAD format; you'll need Version 8.0 to read them.

KiCAD is a fantastic open-source schematic and PCB layout program, it is available at no charge from https://kicad.org.

I used KiCAD to develop the schematic for this interface in stages. I started simple and added components as the project grew, and as my breadboard experiments succeeded. Once the schematic was functional, I spent a day or two cleaning it up, organizing the diagram and labeling the components. This is easy with KiCAD: it has a bit of a learning curve but as you follow the examples in their excellent tutorials you will learn fast. KiCAD is used by industry, academia, and by hobbyists all over the world.

A tutorial for learning KiCAD starts at https://docs.kicad.org/8.0/en/introduction/introduction.html.

Once your schematic diagram is complete, you then move on to converting the schematic to a printed circuit board. KiCAD helps you do this. Once your PCB is ready you can submit it to a board fabrication shop like OSH Park (see https://oshpark.com) and have your PCB made and shipped to you. OSH Park is also a non-profit shop.

OSH Park's fabrication costs are surprisingly affordable: you are charged only $1 per square inch of PCB. As an example, the cost for three PCBs for the CW decoder interface is only US$33.70.

The Interface PCB

Let's look at what a PCB for our CW decoder interface would look like. See Figure 4 *[next page]*.

This is a two-sided printed circuit board with components mounted on the front of the board and copper traces on both the front and the back of the board. It uses "through hole" components: components with leads that get soldered manually onto the board [6]. Front side traces are in red; back side traces are blue. I added four mounting holes to the board and some "silkscreened" text that identifies the components and labels the board.

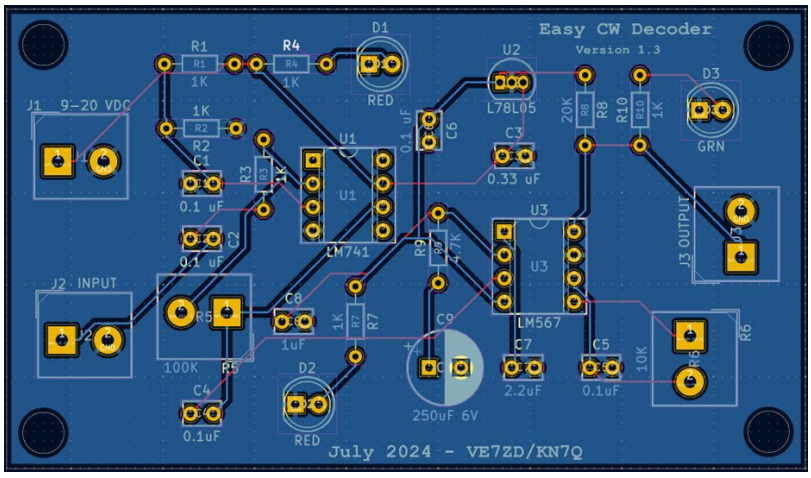


Figure 4 – CW Interface PCB

The board has a large blue background because that is a ground plane: copper on the back of the board to provide a good ground. This will hopefully keep RF from interfering with the interface's operation, and reduce RF emanation from the interface that could affect your transceiver's reception. The KiCAD tutorials cover how to create a ground plane and how to check your board to make sure that 1) it matches the schematic; and 2) that the board's layout meets international quality standards. It's a fantastic design program!

PCB Layout Process

Next let's look at some of the details as to how you convert your schematic to a PCB. Figure 4 is the finished version of the interface PCB that I have placed on GitHub for download.

PCB layout is an art: there are many ways to arrange the parts that form a schematic onto a circuit board. Generally, I try to put inputs on the left side of the board and outputs at the right, but there is no standard, so each creator can do as they wish. You'll develop your own style as you gain experience with KiCAD.

When you first move the parts from a schematic onto the draft PCB, KiCAD will give you a "ratsnest" of all the parts and their interconnections. It's called a ratsnest because the wires (not actual wires, but rather, real time connection lines between parts) go every which way and can overlap one another.

The ratsnest wires that interconnect each part follow each part like rubber bands as the part is dragged into place. Don't worry if ratsnest wires cross: you will sort out the overlaps when you lay out the copper tracks that connect each part. The ratsnest simply reminds you of which parts and which pins are linked. Ratsnest wires come from the schematic.

See Figure 5 for a closeup of a typical ratsnest for a new PCB. The components on the PCB are yellow, and the ratsnest wires are shown in blue. The blue interconnection wires are very hard to see in the figure, but they show up much more clearly on your computer screen. Note how the ratsnest wires overlap. You may have to squint a bit, but that's a result of pasting a screenshot into an article…

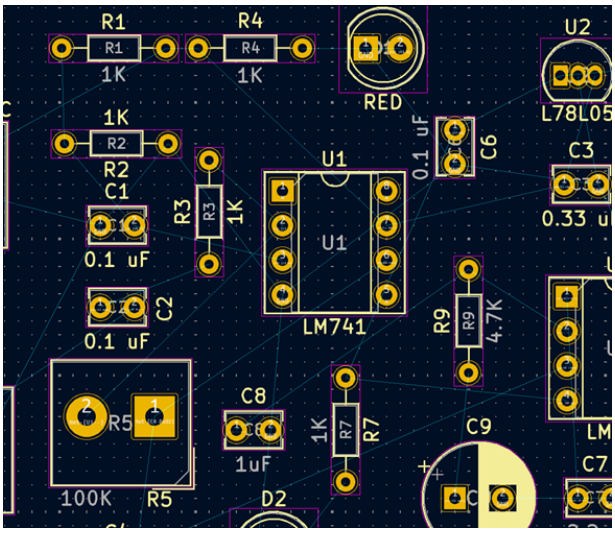


Figure 5 – Unrouted PCB Showing Components and Ratsnest Wires in Blue

KiCAD's PCB design tool is graphical and mouse-driven. You use the mouse to grab each part and move it into position on the PCB. You can flip and rotate parts as necessary and place them on either the front or back sides of the board. The "rubber band" blue interconnection wires follow each part as it is placed on the PCB and moved around.

Here's an example using a very simple schematic. See the left half of Figure 6 for a mundane schematic that uses a battery to light an LED [8]. Such a circuit is hardly practical, but it'll serve for this example. The righthand side of the Figure shows the parts after they have been moved onto the draft PCB. It also shows the blue ratsnest lines, although once again they are hard to see here in the screenshot.

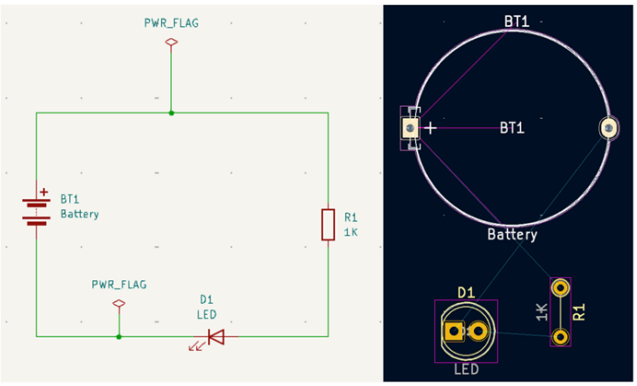


Figure 6 – A Simple Schematic and Its Initial "Ratsnest" on the PCB

Once the parts from the schematic are placed onto the PCB then the next step is to draw the copper links between the components.

Routing Tracks

Once the parts are placed onto the board, then the next step is routing tracks. You do this with the routing tool in KiCAD. Tracks are the copper traces on each layer (usually the front and back sides) of the board that interconnect the parts. Tracks must follow the connections in the schematic diagram. Once laid, a track replaces a blue wire in the ratsnest, but you need to lay out the path of each track yourself. Layout is complete when you eliminate the last blue ratsnest wire.

Routing is not as hard as it sounds, for simple circuits at least. Once all the tracks are laid out then all the ratsnest wires will have been accounted for. The PCB then matches the schematic. The PCB can be double checked, and then sent for fabrication. See Figure 7 for one solution for the PCB layout for the simple LED light circuit from Figure 6. Here the battery (a large coin cell) has been placed on the back of the PCB. I could have placed it on the front side of the board if I wished.

For complex schematics, KiCAD also supports an open-source routing plugin (appropriately called "Freerouting" that will route all the tracks on a PCB automatically. See the author's website at https://freerouting.org/.

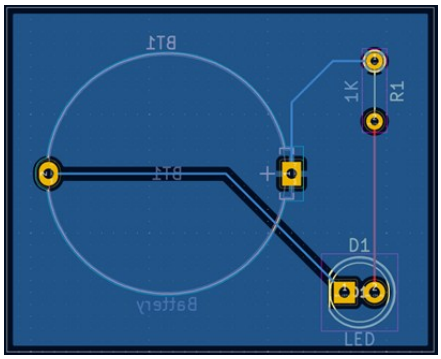


Figure 7 – Parts Placed and Tracks Routed

Auto-routing saves a lot of time, and in fact you can learn a lot from watching the tool work, but it is not always one hundred percent successful. The tool cannot make up for poor placement of parts on the PCB, so when it completes its work there still may be some unrouted tracks (i.e. there may still be some ratsnest wires remaining). It is important to check the board for completeness once the automatic routing has been completed. KiCAD has another tool called DRC (Design Rules Checker) that helps you find unconnected ratsnest wires and other PCB issues.

Back to the CW interface board. Figure 4 above shows what the PCB of our interface would look like with the given location of all the parts. This layout passes the DRC check with flying colours.

You may have chosen to lay out the parts differently. Remember, PCB layout is an art: there are many more part placement locations that will be successful, take up less PCB "real estate", or be easier to solder or to understand. Consider Figure 4 simply as one version, or one concept, for how the PCB for the CW decoder interface could be laid out.

3D Modeling

KiCAD can also render a 3D model of your PCB so you can see how it will look when the board is completed and "stuffed" with your parts. See Figure 8. You can shift and rotate the 3D model interactively. This facility can help you discover issues with connectors, parts placement, and other physical factors. It also looks really cool to see your PCB as it will look as a real world device.

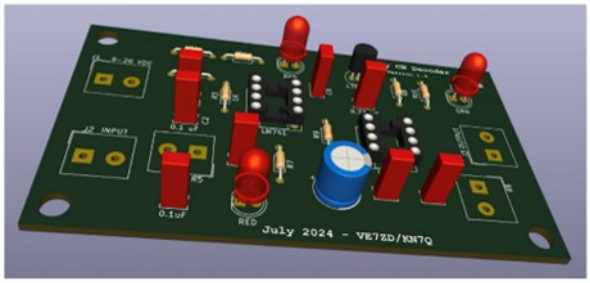


Figure 8 – KiCAD's 3-D Model – Two Views of Our Interface Board

Summarizing the KiCAD Overview

I'm sure that you understand the concepts and can see how KiCAD can really help you develop schematics, test circuit designs, and create professional-looking circuit boards. It's a fantastic tool, it is open-source, and it's absolutely free.

Once you have a board layout that matches the schematic and passes KiCAD's built-in DRC (design rules check), you can simply upload the board file to OSH Park or another fabrication service to order a real circuit board. I use OSH Park exclusively: see [7] for the reasons why.

The fabricator will produce your board and mail it to you in a week or two. As I stated above, the cost is surprisingly low. OSH Park charges about $1.66 per square inch of PCB. The CW interface board is 98x34 mm in size so that it will fit in a standard size Hammond metal project box. That's a 5.17 square inch PCB. A single copy costs $8.61.

That's it for a short overview of KiCAD. I'll have more to say about the open-source program in an upcoming column!

Next Issue: If You Build It, Will They Come?

Next issue I want to return to the social side of amateur radio and its culture. I'll look at technological innovation and how new technology gets developed and deployed within the amateur radio sphere. Ham radio has a long history of innovation and discovery, but walking that road is not always easy.

It's not as simple as coming up with a great idea and having the new technology "go viral" within the ham radio community in a matter of weeks or months. There is always resistance to change, and overcoming this resistance can be challenging, even for a new technology that is leaps and bounds ahead of current amateur practises. We'll look at this topic in some detail.

Conclusion

That's it for this issue. Even if you do not build the CW decoder that we have discussed I hope that you have gained some insight into how a relatively complex

problem is conceptualized and solved in logical stages.

If you are new to computer programming, maybe you learned a bit about software development, and how a key part of computer-based solutions is deciding what parts of the problem need to be solved in hardware, and which in software. Arduinos are everywhere and with a bit of programming and the odd interface they can do amazing things.

If you have relatively little hardware experience, I hope that you gained a bit of knowledge from analyzing the interface's schematic in the form of a block diagram. If you have some electronics experience, then I hope that the discussion of KiCAD will spur you on to download the program and give it a try on your own PC or Mac.

Feedback on Radio Ramblings is always welcome and may be directed to the Editor, or directly to me at mcquiggi@sfu.ca. Thanks for reading!

73,

~ Kevin VE7ZD / KN7Q

References:

[1] "The Communicator" for April-May 2024 is at https://archive.org/details/SARC_Communicator_2024-07 and July-August 2024 is at https://bit.ly/SARC24Jul-Aug.

[2] The idea of fuzzy decoding dates from the relatively early days of computing science in the 1960s and 1970s when researchers were looking at how consideration of human factors and the superiority of "brain-based" problem solving could be represented in the simple computer systems of the day. This research predated the development of "neural nets" but was a foundational component of early research into artificial intelligence. Two excellent books that include discussion of these topics are "Computer Power and Human Reason" by J. Weizenbaum, 1976 ISBN 0-7167-0464-1; and "COMPUTERS" by C. Davidson and E. Koenig, 1967 Library of Congress 67-19447: chapter 14 "Does it have to Be a Moron?" is especially relevant. These are older books, but their content is prescient and quite relevant to AI in the 2020s.

[3] The code for CW decoding is on GitHub. Download it from https://github.com/mcquiggi/CW-Decoder. It will run on most of the current Arduino devices.

[4] OSH Park is based in Oregon, USA. I have used their services for about a decade for both hobbyist and professional circuit board fabrication. Staff is friendly, helpful and professional. Their website is https://oshpark.org. It is easy to upload a test board (without having to order it) to see if your design meets standard fabrication criteria. They also have an active online community and tech support if you need it.

[5] ATmega328p datasheet is at https://ww1.microchip.com/downloads/en/DeviceDoc/Atmel-7810-Automotive-Microcontrollers-ATmega328P_Datasheet.pdf.

[6] KiCAD also excels at designing PCBs that use surface mount components. This type of board is harder for hobbyists to assemble, so through-hole boards are preferred for beginners. I'll cover surface mount components and PCBs in a future column.

[7] I use OSH Park because they are a North American organization that respects intellectual property rules. Your schematic and your PCB are your property, and OSH Park will never release your design or share it with others without your permission. There are several offshore PCB fabrication shops that will make your board for lower cost than OSH Park, but if you use these firms then there is a risk that the shop may "appropriate" your design and share it with their government or sell it to partner companies that may decide to copy your design and sell it commercially. A foreign company may produce and sell your design without giving you credit and without offering you any remuneration or royalties. I see this as an unfair business practise, so I avoid any dealings with offshore fabrication services.

[8] Ignore the two components called "PWR_FLAG" in the schematic. They are used to let KiCAD's schematic checking intelligence know that these lines connect to a power source – in this case, a battery. These "virtual components" are usually not required, and do not appear on the PCB in any case. The KiCAD tutorials explain when and how to use PWR_FLAG.

Surrey (BC) School District's Summer School RF Communications Course

Surrey Schools students take to the airwaves in new course

by JOHN SCHOUTEN VE7TI

John VE7TI and Adam VE7ZAL taught an RF Communications course for Summer School students in Surrey, BC

A group of Surrey students spent a month of their summer break learning about radio frequencies in a groundbreaking electronics course, potentially the first of its kind in Canada.

Held at Kwantlen Park Secondary in Surrey, British Columbia, this past July, the RF Communications course introduced students to radio frequency technology. In addition to earning their Canadian Amateur Radio Certification, students received an Electronics 11 credit. In its debut year, the course saw twenty-one Grade 8 to 12 students enrolled.

The course was proposed to the school district by electronics and robotics instructor Adam Drake, VE7ZAL, who recently graduated from the Surrey Amateur Radio Communications Basic course. Despite initial concerns from the School Board regarding the value and benefits of this area of study, permission was granted, allowing planning to begin. Adam approached me with the idea, suggesting it would complement the instruction he provides during the regular school year. Students receive no training in RF communications, although it surrounds them and is a critical component of their electronics and robotics projects. Being retired with no specific travel plans, I eagerly agreed to co-instruct.

My personal goal was to sustain the amateur radio service by introducing it to younger generations, enhancing public perception of our hobby, and raising student awareness of career opportunities in this field. Throughout the course, we witnessed students experiencing significant revelations about the pervasive role of radio in our daily lives. They were

also astonished by the capabilities of even the most basic equipment. One example was my 2m Yagi antenna, crafted from PVC pipe and a chopped-up tape measure. Students were amazed at the ingenuity of the hobby and that such an antenna could reach the International Space Station.

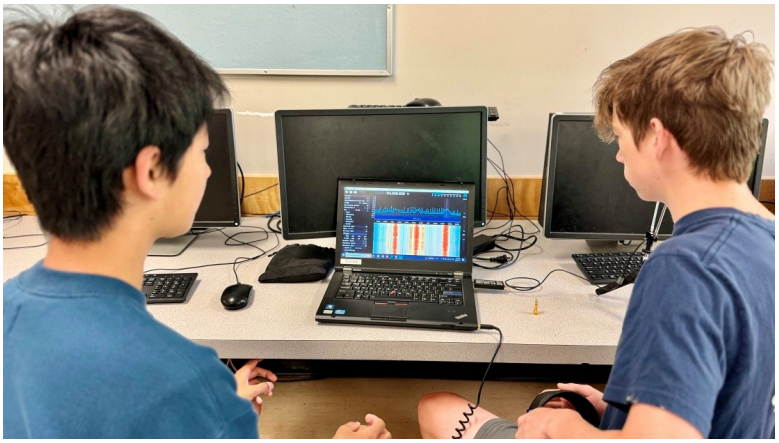
We also stressed the crucial role that radio operators would play in the event of a regional emergency. Most students had cell phones, and the realization that commercial infrastructure could be compromised brought a revelation of amateur radio's technological independence. This understanding made students very receptive to the idea assuring personal communications and of the service they could offer after attaining their qualifications.

As a Basic course instructor for three organizations, I have infrequently graduated students as young as 11 years old, accompanied by a parent also taking the course. Most of my past students have been adults, including some in their eighties. They are generally very responsive to the instruction offered. However, in front of this class of 13- to 17-year-olds, I initially felt flustered by an apparent lack of attention. Adam assured me not to be concerned, as this was normal in his experience. After a few days, a level of comfort became more evident, and students began approaching me with questions about both the instruction and my experiences.

The course was a combination of formal presentations on material from the Canadian Basic Question Bank and practical demonstrations and experiments covering Ohm's Law, inductors, capacitors, and modulation. Throughout the four weeks, the level of interest rose significantly. Two of the students, known to Adam from previous courses, were particularly keen. They had covered many of the basics in earlier electronics studies and assisted other students. They also worked ahead, so much so that they wrote their Basic qualification exam after only two weeks, one of them passing with 90%.

Adam had purchased twelve handheld transceivers, an antenna analyzer, and other supplies using grants from Radio Amateurs of Canada, Amateur Radio Digital Communications, and the Surrey School Board. On the second day, the students were split into two groups, and using Adam's and my callsigns, we encouraged them to make a simplex radio contact. Mic shyness was a major obstacle, but with a bit of coaxing, one of the more talkative students hesitantly took the mic and pressed the PTT. This was repeated every few days, and they became more comfortable with each attempt. I arranged for some of our SARC members to monitor, which exposed them to unfamiliar voices. By the end of the course, most students had completely overcome their hesitation.

We have a "Get On The Air" (GOTA) net every Thursday evening at 8 pm. This was initiated to give our new course graduates an opportunity to familiarize themselves with net procedures and to ask questions, typically running for an hour. During the last week of the course, many had already passed their exams and received callsigns. That Thursday, most checked in, and the



RTL-SDR dongles were used to introduce students to reception of different modes and bands

exchanges lasted for an amazing 3½ hours, certainly a record for any net on our repeaters.

To bring real-life examples of the technology, we arranged for several guest speakers from various fields of technology and our hobby.

Blair Thompson, an electronics instructor from the BC Institute of Technology, visited during the first week. He spoke about career opportunities and the high success rate of job postings for graduates from their two-year program. BCIT donated a range of equipment including function generators and CB radios to help demonstrate AM modulation.

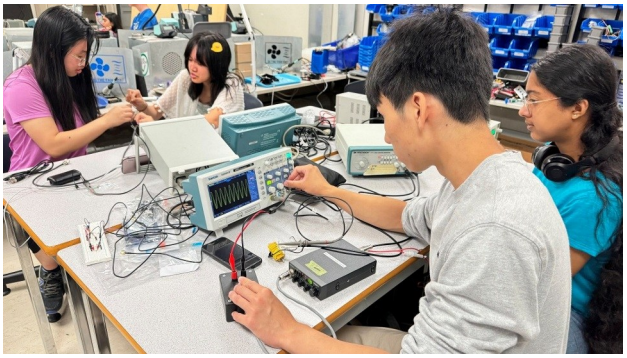
Supporting our program, the wide area public service radio network for southwest BC, also participated with three guest presenters. E-Comm provides 9-1-1 services for the province and dispatch for police, fire, and ambulance services for the Metro Vancouver area and beyond (https://www.ecomm911.ca/).

Dave Cameron VE7LTD, the E-Comm System Engineer for Technology Services, discussed his expertise in locating sources of interference and remediating poor signal areas. He illustrated several examples, including errant baby monitors and RV TV signal amplifiers, and compared this with amateur radio ARDF, or 'fox' hunting, which students had the opportunity to practice in the last week of the course.

Dave is also the creator of IRLP, the technology that links local stations with distant ones using Voice over IP. This innovation transformed amateur radio, enabling certificate holders with only Basic qualifications and an inexpensive transceiver to communicate worldwide. It also revolutionized commercial communications. In the school field, he demonstrated the process and made a contact with an amateur in Hudson, MI.

RAC British Columbia/Yukon Director Keith Witney VE7KW dedicated his time to present an overview of both the RAC organization, its role and membership benefits, and his own exploits in DXpeditions worldwide. His slideshow perfectly illustrated the commitment of die-hard contesters to the hobby and their desire to provide other amateurs with the opportunity to contact rare entities. His stories inspired several students with excitement of future foreign travel.

Dave Cameron VE7LTD, the "father" of IRLP demonstrates his system to the students by making a contact with Hudson, Michigan



The students put theory into practice using a CB transceiver into a dummy load. The audio sine wave modulation is fed in as a separate signal to display the carrier and modulation envelope on the oscilloscope.

Dmitry VA7DVO shares his expertise on POTA with a live demonstration

SARC member Dmitry Sevostianov VA7DVO volunteered a day off work to demonstrate his expertise with Parks On The Air (POTA). After a classroom presentation, he set up his gear on the school grounds and made several HF contacts. The portability and ability to operate in a park setting intrigued several students who later indicated that this was a facet of amateur radio they would explore further.

I had spoken in class earlier about my contacts with satellites and the ISS, including speaking with an astronaut. SARC member Adrian Mashhadi VA7YEG demonstrated his satellite gear and made several contacts, showing that it is neither difficult or expensive.

One of the true highlights of the course occurred in the third week. Adrian Stimpson VE7NZ and Scott Leaf VE7SL have been

[Above] Adrian VE7NZ [right] and Scott VE7SL make last minute adjustments to the balloon transmitter before launch.

[Below] All eyes are on the balloon , now a mere spec as it drifts northward gaining altitude. Signal reports were already being received from California, Idaho, Alberta and Alaska.

launching high-altitude balloons for several years. Their most recent launch had disappeared over the Atlantic Ocean, but they were prepared, weather permitting, to make another attempt from the Kwantlen Park school grounds. On the day of the launch, the weather was perfect. After an entertaining and informative class presentation, we headed outside. The balloon had a WSPR transmitter to send its six-digit grid square location, voltage, and temperature every ten minutes on 14.097 MHz. Unfortunately, there was a technical issue. Undaunted, Adrian made an on-the-spot circuit repair with his butane soldering

Icarus' path across Canada before crossing the Atlantic to Scotland.

torch to reverse a Zener diode, and the launch could continue. Initially, it looked as if a downdraft might scuttle the attempt as it headed towards high-rise buildings in Surrey's downtown core. Fortunately, the balloon and its payload rose again, and we spent fascinating minutes watching as it disappeared north into the distance, a mere speck against the blue sky.

This demonstration brought several unexpected benefits. Some students frequently checked the progress of 'Icarus', as it had been named, while others studied the high-altitude jet stream to calculate the expected path. Given the inexpensive components and simplicity of the design, it generated much interest for launching a future balloon project of their own.

Students monitor while Adrian VA7YEG makes contact with satellite SO-50 passing overhead.

Icarus was lost over the Black Sea in Europe around July 30th, dashing hopes of circumnavigating the globe.

Kyle Giroux, E-Comm Wireless Operations Manager—Technology Services, discussed the wide area radio system, the largest multi-jurisdictional, tri-service emergency radio system in BC, highlighting the technical issues that need to be resolved to keep the system operational. He demonstrated how the Next Generation Radio Program is replacing the original 800 MHz Enhanced Digital Access Communications System with new digital radio technology known as Project 25 (P25) in the 700 MHz band. This includes a bylaw mandating the installation of their repeater stations in all new underground and multi-story construction in the City of Surrey to ensure seamless communication for emergency services. He also emphasized the importance of encryption and data security. A valuable component of his presentation was his own career path, from an interest in electronics as a teen, to BCIT and into the career market leading to his current position. With the assistance of Gord Kirk VA7GK, the Senior Wireless Service Delivery Manager, three students have already made arrangements for a visit to E-Comm's facilities, with a view to looking into future employment and career opportunities.

Darius Naaykens and Dave Love from Cartel Systems came in to explain how they install radio amplifying and repeating equipment within new buildings and malls to enable emergency services communications wherever they are installed on site, including the lowest parking garages. They brought a test transmitter and spectrum analyser and took the students for a walk around the school to demonstrate how the building affects EMS radio signals.

Linda Annis, a City Council member for the City of Surrey and a strong supporter of our amateur radio activities as part of the city's emergency program, visited on the last day to thank the students for their dedication.

She encouraged them to continue exploring technology as a career path and took the time to visit with many of them individually to discuss their experiences in the program.

The final presenter was SARC member Reg Natarajan VA7ZEB, who came in to speak about his extensive collection of handheld transceivers from several manufacturers. The goal was to allow the students to have an informed choice when making their first purchase. Reg has been performing some ad hoc testing on their listed specifications, including the propensity to transmit spurious signals. This was beneficial as many students had already purchased, or were intending to purchase their own transceiver, with one student having already purchased two.

We received some parent feedback as well. The most satisfying was as follows:

I am writing to share the joy that both William and our family are experiencing. He was thrilled to inform us that he passed the exam after he knew the result, and his excitement and fulfillment have truly uplifted us. William has been working diligently these past few days, "Hard work pays off.", that's what he said to us after passing the exam.

We are incredibly grateful for the opportunity you provided him, which not only enabled him to earn his certificate but also taught him the value of hard work. This experience has been invaluable and truly worthwhile. Thank you once again for your dedication and for bringing happiness to William and our family.

Student commitment to the course was evident early on. After all, they were there voluntarily, giving up four weeks of their summer holiday, and most did not know each other, having come from schools across the district. This commitment was reflected not only in their level of participation but also in their camaraderie as a group. For example, they wanted to create a sticker to commemorate the class and plan to initiate their own lunchtime school net on our local repeater. Plans are underway not only to start a club at Adam's school, but to support other students who are interested in starting clubs at their schools, with volunteers from SARC supporting them with loaned equipment and expertise. The two Kwantlen Park students who obtained their Advanced qualification plan to sponsor a school callsign.

Our class photo. Adam VE7ZAL is 4th from the left, I am on the right.

The final tally? We certified 13 Basic, 3 Honours, and 2 Advanced for a total of 18 out of 21 that started. We have scheduled two follow-up sessions in August: one to bring them into our training station for an antenna workshop and time on the HF and satellite stations, and a second for an additional exam session to give two of the younger students, who have not yet passed, some extra study time. Several students with Basic certification want to upgrade to Honours to get their HF privileges, and an additional two students wish to try for Advanced. We even have two students indicating a desire to learn CW.

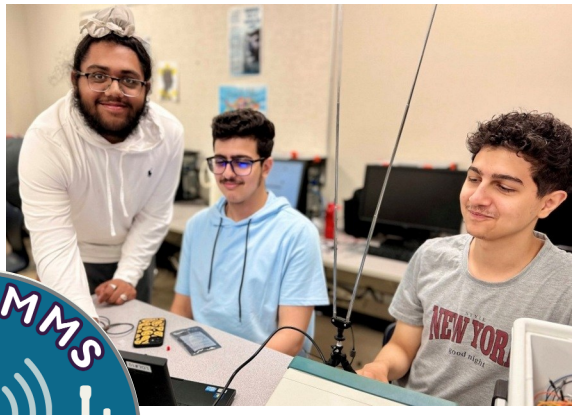
From my perspective, it was well worth my time invested. I came away with tremendous satisfaction that our goal was realized and that we now have young amateurs who can grow into the service and a potential future career path. Adam concurs and is excited to take this further. Plans are already underway for a repeat in 2025 and to see if the initiative can be expanded to include RF

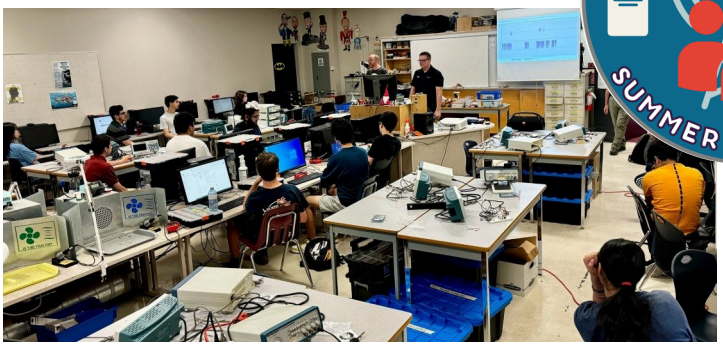
Communications in electronics programs in other Surrey schools, and perhaps beyond. In the meantime, I'm enjoying multiple daily conversations with our new cadre of hams, and mic shyness... it's like it never existed.

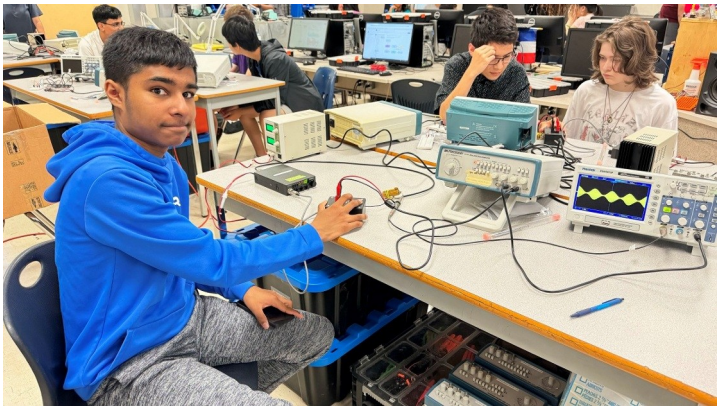
Should you wish further information on the program, please contact Adam ve7zal@gmail.com or myself VE7TI@myrac.ca

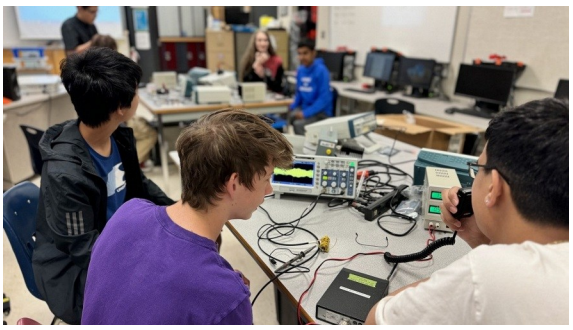
~ John VE7TI

"OJ" shows off the course sticker she designed and distributed to the class.









Pi Pico

on a breadboard

by AL WILLIAMS—HACKADAY

Up to 30 MHz with better performance than a USB dongle

How hard is it to make a fully standalone SDR? [101 Things] shows you how to take a breadboard, a PI Pico, and two unremarkable chips to create a capable radio. You can see the whole thing in the video below.

The design uses a standard Tayloe demodulator. There's also an encoder and an OLED display for a user interface. You might also want to include some PC speakers to get a bit more audio out of the device.

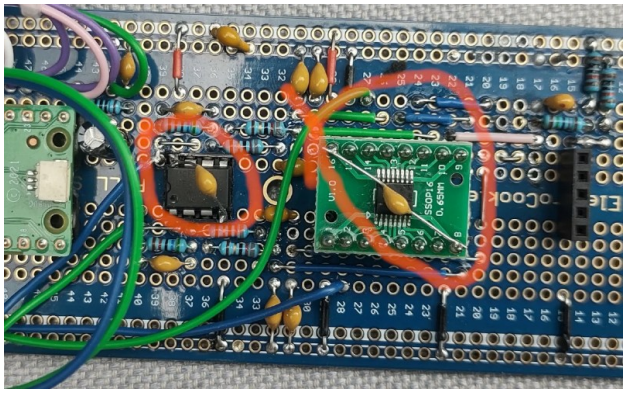
The PCB breadboard in question seems to work at higher frequencies, although the construction is very careful not to have long wires. This is a simplified version of an earlier design, so the software on GitHub is mature and can decode AM, FM, and SSB. The radio tunes up to around 30 MHz.

If you don't want to change the program, you can download precompiled firmware, too. This would make a great weekend project, and there's even a 3D-printed case design you can download for aesthetics. You may need to order a few parts ahead of time, so plan accordingly.

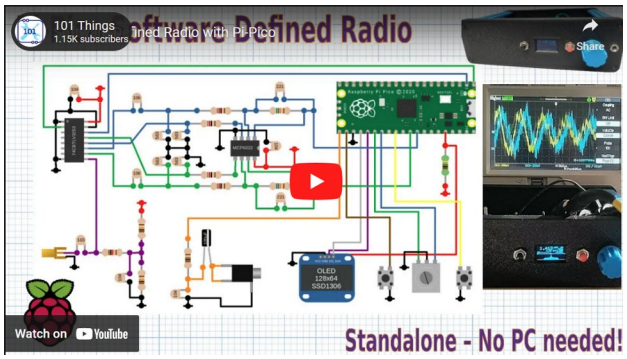
If you want even fewer parts, it is possible. Need an antenna for your slick new shortwave? We tried a few.

~ Al Williams—HACKADAY

The original article is at: Pi Pico SDR On A Breadboard | Hackaday



From the author's location in thee UK [map above] the device produced great results.



Click above for the YouTube video.

Build a novel antenna

Yes, even from a pair of crutches

by JOHN SCHOUTEN VE7TI, based on an article by BOB FISCHER WB8BEL

For years I have included the photo below in our SARC Basic Amateur Radio Course. It showed a dipole antenna made from crutches, and I use it as an example of the ingenuity of Amateur Radio operators and the fun of experimentation by questioning if it will radiate. I never knew the origin of that photo until I came across this article.

The fascination with radio signals began in Bob's childhood with a crystal radio set, leading to a lifelong hobby of experimenting with antennas. Without a battery or any other source of power, this magical little device would pick up radio stations and play them through the earphone. All he had to do was attach one of the alligator clips to an "antenna."

Bob soon discovered that most metallic objects a few feet in length made good enough antennas to bring in the closest AM station. Attaching the second alligator clip to metal that was "grounded" or in contact with the earth improved signal strength and brought in weaker signals.

And, there you have it, the basics of a dipole.

Most thrift stores have lots of crutches at very low prices.

Early Experiments

Bob's initial experiments involved using various metallic objects as antennas to pick up AM radio signals. These experiments taught valuable lessons about the effectiveness of different materials and the importance of grounding.

Lifelong Passion

As for many of us, the hobby evolved into a serious pursuit, leading to the study of electronics and electrical engineering. Over the years, various types of antennas were built using diverse materials, including copper wire, aluminum conduit, and even unconventional items like bedsprings and fences.

The Crutch Antenna

A recent project involved transforming surplus aluminum crutches into a functional antenna. The crutches, with adjustable sections, were ideal for creating a 6-meter dipole antenna. The project required minimal tools and materials, making it an accessible and cost-effective endeavor.

The crutches were secured to PVC pipes using screws, and the design was reinforced for stability. The completed antenna was tested and adjusted for optimal performance, as low as 1.1:1 SWR, demonstrating the potential of repurposing everyday items for innovative solutions.

The journey from a simple crystal radio set to building complex antennas highlights the endless possibilities in the field of radio communications. With creativity and experimentation, even the most ordinary objects can be transformed into effective tools for signal transmission.

For those without HF privileges, remember that the 6 meter band (50 MHz) is accessible to you as well and propagation can be extraordinary.

~ You can read Bob's article with construction details in full: Build a 50 MHz Dipole Out of Crutches | Nuts & Volts Magazine (nutsvolts.com)

He can be reached at BobFischer@FischerTechnical.com

My particular set of crutches happen to be rated for 300 pounds. Each crutch has two separate adjustments. The upper section has three settings 5-1/2 inches and 6 inches apart. The lower section has 13 positions in one inch increments.

A 1-1/2 inch schedule 40 PVC tee and two 3/4-1-1/2 reducing bushings appeared to be just the right size for reinforcing the lighter 3/4 inch PVC.

My Oscilloscope Clock Project

A repurposed ‘scope has a new life

By GARY PEARE VE7GPR

I should start with little history, first I’ve been build projects as long as I can remember , everything from crystal radios to complex computer controls such as for my train set! I have always been a tinkerer.

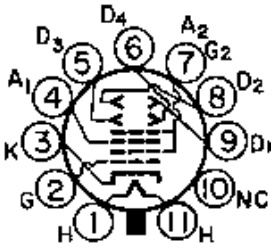
So I was surfing the Web and saw a picture of an “Oscilloscope Clock” project. Intrigued I did a little bit of research and found all kinds of these advertised on AliExpress. Some advertised were complete projects with CRT and such, and other just the barebones controller board. All these boards are designed to use east-bloc, or Chinese CRTs, but can be adapted to use a variety of American types. The board I selected is made by ‘Xiao Ni’ and costs about $120 on AliExpress. Very little info is included, so you have to do your own research on the CRT and such to use with this board. The connections to the board are quite straight forward, with the pin-outs silkscreened on the board and included wiring connectors. The pin-outs however are identified for a Chinese CRT type “8SJ31J” so again some research is required here to adapt to your chosen CRT. In my case I used a ‘3KP1’. This tube was made in 1943; on an RCAF training tool oscilloscope. So I made up a pin-out conversion sheet to adapt the pins for the 3KP1. Some extending of the wires was required to fit the board on the base of the old oscilloscope chassis. Also some terminology was somewhat different between the specs for the Chinese CRT and the American one, more on that in a bit.

Now a little bit on the CRT. Oscilloscopes and early television sets used electrostatic deflection of the electron beam. Later TV’s used electromagnetic deflection, aka a ‘yoke’ on the neck of the CRT. We deflect the electron beam in two axis’s X and Y, or horizontal and vertical. In the case of my 3KP1 being electrostatically

controlled we have 4 special plates, 2 for swinging the bean up and down, and two to swing the beam left and right. To generate the beam we have a small particle accelerator or as it is commonly known as an electron gun. We have a filament and cathode to provide the source of electrons, where in our case the cathode is biased to minus 1000 volts! This provides the required potential difference to the Anodes, or 'plates'. Beyond the cathode we have a control grid which provides the signal or modulation of the electron flow to the screen, following that we have a focus anode A1, and here was my first issue! The Chinese labeled this focus anode as A2, and the American labeled as A1. I found this out when I first powered up the clock and saw just a 'splotch' on the screen and then referring to the CRT diagrams found I had to swap the two. I had also had to reverse the connections on the horizontal deflection plates as the clock was displaying the clock in a mirror image.

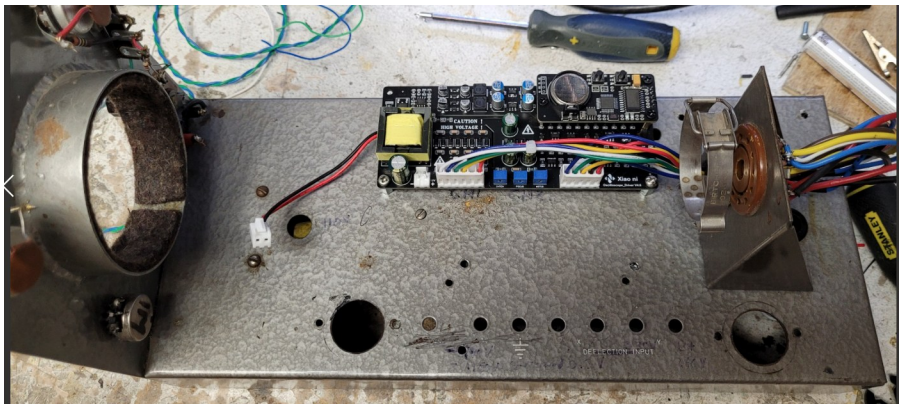
Finally we have the A2 Anode and the aforementioned X, Y deflection plates. Then all we have to do is provide the necessary signals to the grid and deflection plates. Without too much detail, we have a HV power supply and a microcontroller clock unit. The microcontroller provides the vector graphics to the screen by modulating the deflection plates X, Y coordinates. Blanking and control is sent to the control grid in the CRT. At least near as I can tell you anyhow.

The main board has all the identifying info of the chips wiped off! Near as I can tell once again, the main MPU appears to be an Atmel type. The clock or RTC is maintained by a CR2032 Li cell. There are a variety of clock faces and options available by a push of a button, my favourite being the Roman numeral face. The main supply from AC is provided by a small 3A 12v switching power supply, or you can run off batteries. There are options as well for this unit, such as providing GPS time keeping via a serial connection much like Dino's SARC GPS Clock.



~ Gary VE7GPR

Another example is on YouTube: https://youtu.be/hNw1zyzBAzw

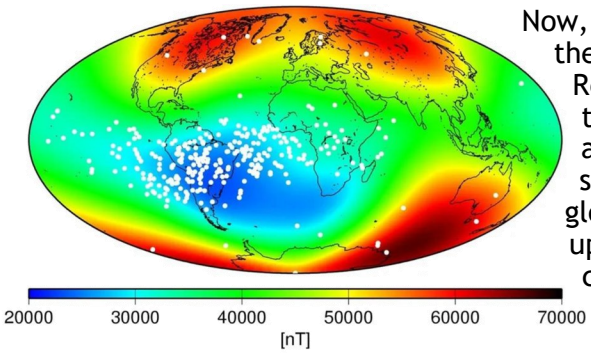


The southern lights

Aurora Australis

by PAPAKURA RADIO CLUB

We've heard plenty lately about the Northern lights, Aurora Borealis, but it turns out there is an anomaly in the Atlantic that makes the NZ auroras (or at least some of them) weaker, and therefore dimmer. The South Atlantic Anomaly is a large, oval-shaped region over South America and the southern Atlantic Ocean where Earth's magnetic field is weakest. The anomaly is already well known for allowing charged particles from the sun to dip close to Earth's surface, exposing satellites orbiting above to high levels of ionizing radiation, according to NASA.



Now, a study published in the journal Geophysical Research Letters finds that this weak region also affects the southern aurora, the glowing lights in the upper atmosphere that can be seen at high latitudes.

The southern lights occur over and around Antarctica and are the equivalent of the northern lights that dance over the Arctic and the subarctic.

The researchers used data from an instrument aboard the FengYun-3E satellite, launched in 2021, that measures magnetic-field variations. They found a "substantial weakening" of magnetic fluctuations in the aurora australis, or southern lights, where it overlaps with the South Atlantic Anomaly.

To confirm the findings, they also analysed ultraviolet light from this region of the aurora using data from the US Defence Meteorological Satellite Program. This also showed a weakening in the southern lights around the anomaly.

~ Papakura Radio Club Spectrum newsletter (NZ)

http://www.qsl.net/zl1vk

Photo: Southern lights in New Zealand

A Special Interest Group for the iCOM 7300, 7610, 9700 and compatible models

Improving reception

A Guide to Maximizing Your Radio's Performance

by JOHN SCHOUTEN VE7TI based on a video by PETER WATERS G3OJV

In today's world, where technology has evolved at an unprecedented rate, the way we interact with our radio equipment has changed significantly. Gone are the days when it was common to delve inside your equipment with a soldering iron, making modifications to improve performance. Modern radios are far too sophisticated for such tinkering, with components too small and warranties too easily voided. However, there are still ways to optimize your radio's performance without risking damage or invalidating your warranty.

Peter Waters G30JV

Maximizing Your Receiver's Potential

Clicking on the photos below will take you to the appropriate portion of Peter's video.

Many radio enthusiasts often overlook the basic settings on their receivers that can significantly enhance their experience. One of the simplest yet most effective adjustments involves understanding and properly using your radio's built-in features, such as the RF gain control and speaker placement.

Speaker Placement: Small Changes, Big Differences

The placement and positioning of your speaker can have a profound impact on the intelligibility of the audio you receive. A simple trick is to place a reflective surface, such as a piece of card, behind your speaker to deflect the sound forward. This small adjustment can make a noticeable difference in how clearly you hear the transmissions.

RF Gain Control: Fine-Tuning for Clarity

The RF gain control is another feature that is often ignored or misunderstood by radio users. Many tend to set it to maximum, not realizing that this can introduce unnecessary background noise. By carefully adjusting the RF gain, you can reduce the noise floor to a more comfortable level, making the overall listening experience more pleasant without losing signal quality. This adjustment harks back to the earlier days of radio, where such manual tuning was a routine part of the hobby.

Tone Control: Filtering for Better Intelligibility

Modern transceivers, like the Icom IC-7300, offer advanced tone control features that allow you to adjust the audio passband by modifying the high-pass and low-pass filters. By setting the high-pass filter to around 200 Hz and the low-pass filter to 2000 Hz, you can effectively reduce the amount of irrelevant noise in the lower and higher frequencies. This simple adjustment can significantly improve the intelligibility of the received signal, making your listening experience more enjoyable.

IF Bandwidth: Enhancing Signal-to-Noise Ratio

The IF bandwidth is one of the most crucial settings on your transceiver, as it directly impacts the signal-to-noise ratio. By narrowing the bandwidth, you can reject interference from adjacent signals, thereby improving the clarity of the signal you are trying to receive. Most modern transceivers allow you to customize this setting, giving you the flexibility to find the perfect balance between signal clarity and noise reduction.

Passband Tuning: Customizing Your Listening Experience

Passband tuning is another powerful tool available on many modern transceivers. By shifting the IF passband either higher or lower, you can emphasize certain frequencies over others. For instance, boosting the higher frequencies can enhance treble sounds, while emphasizing lower frequencies can accentuate bass. This feature allows you to tailor the sound to your personal preferences, ensuring that you get the best possible audio quality from your transceiver.

Noise Reduction: Combining DSP with Treble Boost

If your transceiver is equipped with Digital Signal Processing (DSP) noise reduction, you can further enhance its performance by slightly boosting the treble frequencies. By moving the passband slightly higher, you increase the treble response, which can actually improve the effectiveness of the DSP noise reduction. This small adjustment can lead to a noticeable improvement in how well your transceiver handles noise, especially in challenging environments.

AGC Settings: Smoothing Out the Noise

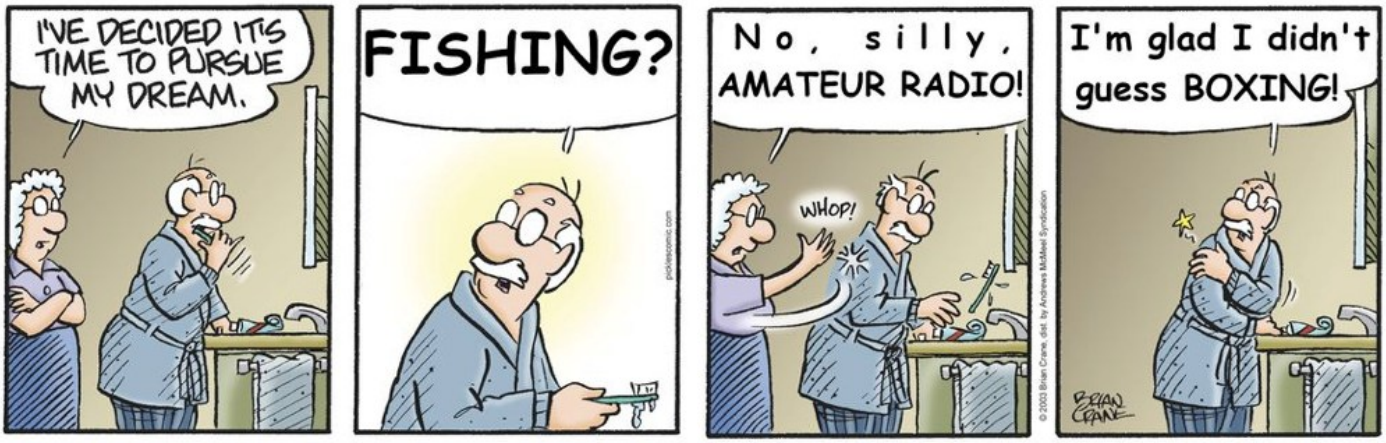
Lastly, don't forget about the Automatic Gain Control (AGC). Setting the AGC to a slower speed can prevent noise from creeping in between stations or syllables, resulting in a smoother and more comfortable listening experience. Fast AGC settings might make the noise more prominent, so a slower setting is often preferable for general listening.

Conclusion: Experiment and Discover

Every transceiver is different, and the best way to get the most out of yours is to experiment with these settings. Take some time to familiarize yourself with the options available on your particular model and make adjustments to suit your environment and listening preferences. Whether you're a seasoned ham radio operator or a newcomer to the hobby, these tips can help you improve your reception and enjoy a clearer, more satisfying radio experience.

~ John VE7TI

Peter's original video is at his watersstanton YouTube Channel and this specific video is at: https://youtu.be/1-zQNz51itg



$1 Million payment

ARRL confirms ransomware attack

By SERGIU GATLAN

The American Radio Relay League (ARRL) confirmed it paid a $1 million ransom to obtain a decryptor to restore systems encrypted in a May ransomware attack.

After discovering the incident, the National Association for Amateur Radio took impacted systems offline to contain the breach. One month later, it said its network was hacked by a "malicious international cyber group" in a "sophisticated network attack."

ARRL later alerted impacted individuals via data breach notification letters that it detected a "sophisticated ransomware incident" on May 14 after its computer systems were encrypted. In a July filing with the Office of Maine's Attorney General, ARRL said the resulting data breach affected only 150 employees.

While the organization has not yet linked the attack to a specific ransomware operation, sources told BleepingComputer that the Embargo ransomware gang was behind the breach.

ARRL also said in the breach notifications that they've already taken "all reasonable steps to prevent [..] data from being further published or distributed," which was interpreted at the time as a veiled confirmation that a ransom was or will likely be paid.

On Wednesday, ARRL revealed that it had indeed paid the attackers a ransom not to prevent stolen data from being leaked online but to obtain a decryption tool to restore systems impacted during the attack on the morning of May 15.

"The ransom demands by the TAs, in exchange for access to their decryption tools, were exorbitant. It was clear they didn't know, and didn't care, that they had attacked a small 501(c)(3) organization with limited resources," it said in a statement published yesterday.

"Their ransom demands were dramatically weakened by the fact that they did not have access to any compromising data. It was also clear that they believed ARRL had extensive insurance coverage that would cover a multi-million-dollar ransom payment,"

"After days of tense negotiation and brinkmanship, ARRL agreed to pay a $1 million ransom. That payment, along with the cost of restoration, has been largely covered by our insurance policy."

ARRL says that most systems have already been restored and anticipates that it will take up to two months to bring back all affected servers (mostly minor servers for internal use) under "new infrastructure guidelines and new standards."

~ from BleepingComputer.com

Taking a radio camping

The noise floor is a lot lower in the forest

by EVAN PRATTEN VA3ZZA

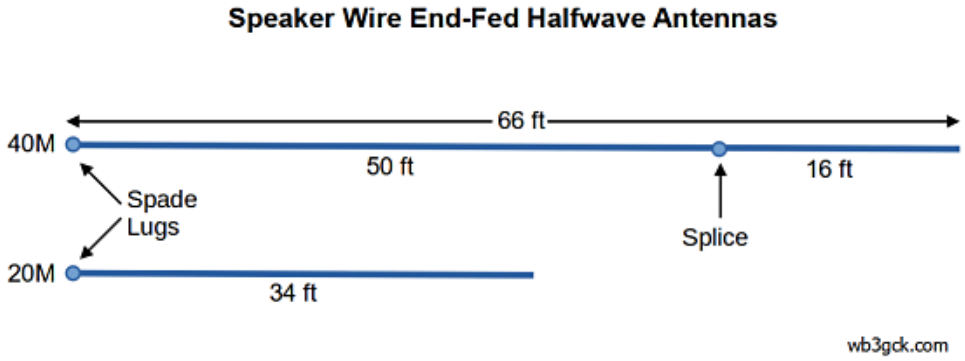
Recently, my father and I took a trip out to a local provincial park for a weekend of camping. Last time I had been camping happened to coincide with the period of time that I was starting to gain curiosity about amateur radio. I vividly recall being out there wishing I had a radio that I could use to communicate from the campsite.

So, to appease my past self, the present-tense radio-license-having version of me took my HF rig along to make some contacts.

Taking a step back

A glaring problem in this plan was that I didn't actually have an antenna to bring. So a week in advance, I set out to build one for the trip.

I opted to build a duplicate of my current fixed-in-place at-home antenna, a slightly more sketchy variant of [WB3GCK's speaker wire end-fed half-wave](#).



Now, I'm not very good at following other people's antenna instructions. I like to tinker with the specifics.

WB3GCK's design was probably intended to produce two distinct antennas out of a single 50ft spool of speaker wire, but I prefer to use the whole thing as a single unbalanced dipole. The more I think about it, the more the math regarding that 34ft segment breaks down, so I choose not to think about it too much.

Having already built one of these antennas before, I just set out to the local Canadian Tire to buy the same components again and repeat my last antenna build.

…slight problem, they didn't have speaker wire.

So I began searching for literally anything conductive, and came across a pile of spools of 24-ft "lamp wire".

Lamp wire looks like speaker wire, so I figured its probably fine. Although the 24ft part was a bit more of a problem. You generally don't want to build your antennas too short, but □▫▫ thats what antenna tuners are for I guess.

Armed with a surprisingly large amount of wire, I began the process of splicing and measuring.

Everyone in my immediate life has spent the past two weeks listening to me say "100 feet is a lot of wire!", so this is now your opportunity to hear it too.

I also decided to hack up the wire packaging and use a little paracord to make insulators for the tips of the antenna.

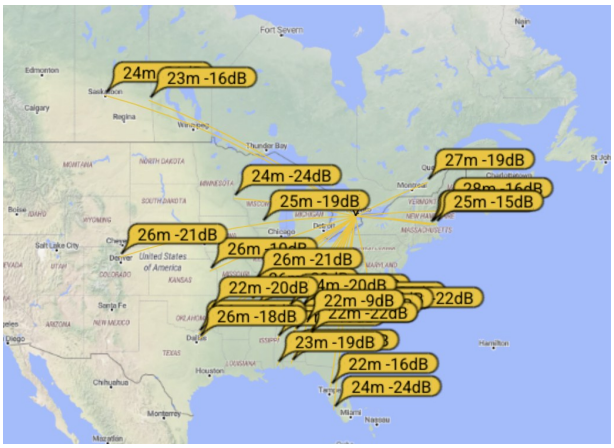
Preflight checks

The next day, I took some time to pack up all my radio gear and give the antenna a test run.

My original intent was to head to a nearby trail and find some trees to set up in. But I wasn't super satisfied with the area, so I instead did what any sane radio operator would do.

I headed across the street, and set up in a grocery store parking lot.

Feeling rather in the open, I sat down, watched out for people, and spun up iFTx to see what kind of reach I could get with my new antenna. For two watts into an incorrectly sized and badly tuned antenna laying on the ground, I was very happy with these results.



Camping time

Fast forward a few days, and I find myself surrounded by trees with a hundred feet of wire in my hand.

I had learned from my earlier trial run that its a good idea to keep some rope with me so I can actually attach my antenna to trees instead of just using hope and friction to keep my little paracord loops attached to twiggy branches.

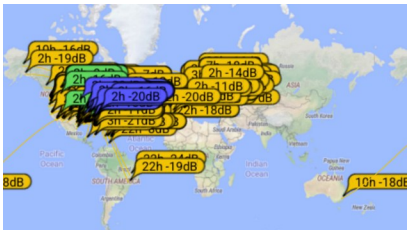
I ended up effectively wrapping the campsite in wire. One end was tied to a tree using some rope, and the other end was tent-pegged into the ground so I could adjust the tension as my brand new wire inevitably stretched over the weekend.

In terms of operation, this setup was awesome. The worst noise I had to deal with was barely pushing an S2, and I was able to make far more (and better) contacts than I had expected.

I had originally intended to spend this trip operating FT8 and CW, but for some reason I found myself really enjoying FT4 (a mode I had never used before), so I spent most of my day camped out on 14080Kc, and then shifted to 10136 and 7074 in the evening.

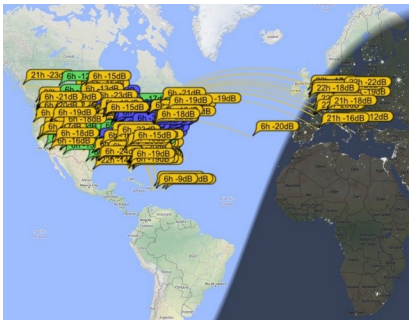
The results

So? How'd I do?



Since I happened to be where the cell service wasn't, I didn't have access to PSKReporter to keep an eye on my signal reports. So those had to wait.

In terms of contacts, I made a bunch. All over the bands (although mainly 20m), and I even set my new distance record! (North-Western Europe from Ontario Canada)



[Top] Day 1 & 2 [below] day 3 & 4

Once I finally caught enough of a glimpse of a network connection, I was blown away by the signal reports. By far the best I've ever received!

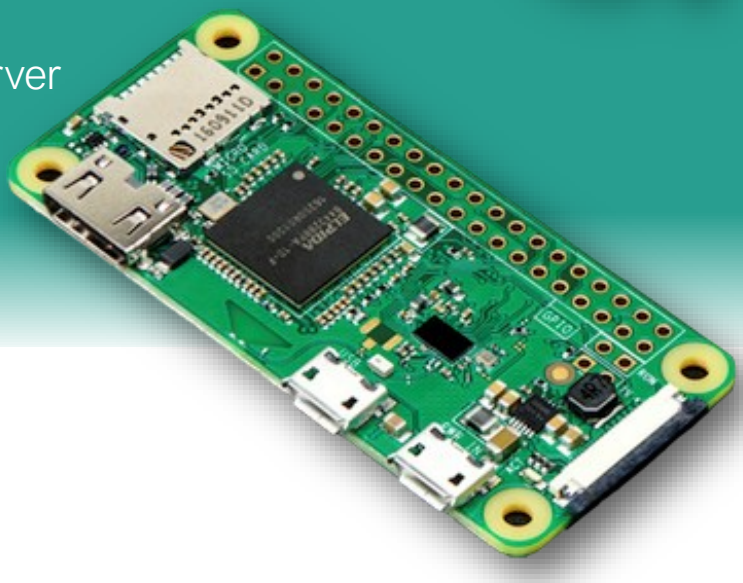
All on… checks notes… 7 watts!

~ Evan

Reproduced with permission of the author. Evan's blog is at: https://ewpratten.com/blog/camping-radio/

HamClock on a Raspberry Pi Zero 2 W

Welcome to the HamClock webserver



by ADAM DRAKE VE7ZAL

Adam Drake VE7ZAL
Teaches electronics and robotics at Kwantlen Park High School in Surrey, BC.

I decided recently that I was at the stage of my amateur radio journey where it was time for HamClock! Because of the nature of my habitat, however (apartment living, no dedicated "hacker" space, minimal equipment, regular setting-up and dismantling, etc.) I recognised that I would not be able to have a dedicated computer or monitor to display my HamClock. What I needed was a space-saving, but fully-functioning alternative…

Welcome to the HamClock webserver, running on the tiniest computer I could find - an inexpensive Raspberry Pi Zero 2 W. (The "W" is important - it means it has WiFi capabilities. The regular Pi Zero won't work in this situation).

With this hardware configuration, I could have HamClock running on my home network, on a tiny Pi, sitting behind a plant, next to my WiFi router, and powered by a USB cable driven by said router, providing HamClock to my network, and available to view on any device I wanted, whenever I wanted.

Did I want to view it on my tablet? No problem. As a window on my laptop? No problem. On my phone? Don't be silly! There are visual limitations to consider, especially with my eyesight! How about on my rather large smart TV in the middle of my living room? No problem there either, as it has a built-in web-browser.

To me, in my situation, this was the perfect solution. I had a spare Pi Zero 2 W lying around (I'm a nerd! I have the oddest things lying around in my "tech" drawer), and I rooted through a family stationery drawer and found a discarded 8GB micro-SD card (8GB is really all you need!). The only other requirement was a USB cable (type A to micro-USB) to power it, using a spare USB socket on the back of my router. A case for the Pi is optional.

Now, all I needed was an hour of time, my laptop, the internet, and a micro-SD card reader, and I was in business!

Let me take you on my 6-step journey. Maybe grab a cup of coffee?

So, the place to start is at the Clear Sky Institute website:

https://www.clearskyinstitute.com/ham/HamClock

This site is run by Elwood Downey (WB0OEW), and I plan to use his script to install all the relevant files. I would like to offer a huge shout-out to Elwood at this point for being so very helpful to me in getting my HamClock webserver configured. We back-and-forthed numerous times on email as I worked through a few challenges, and he even re-wrote the install script to include a "webserver-only" option to minimise the processing power required by the Pi Zero. He's a true "Hero of the Hobby"!

Elwood provides very in-depth instructions, and you could just go to his site and work your way through them if you prefer, however, I'm going to go through it step-by-step here.

Step 1: Install the Pi OS on your micro-SD card

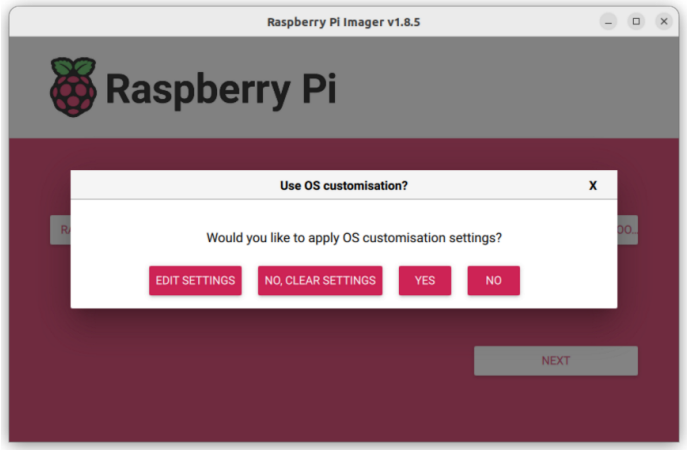
The easiest way to put the Pi OS on your card is by using their imaging software. Go here: https://www.raspberrypi.com/software/

and download the software for your computer's OS. I'm using Ubuntu Linux, but they have it for Windows and MacOS too. Once it's downloaded, insert your micro-SD card into your reader, and pop it into your computer. Run the Pi imaging software, and select the following options:

- Raspberry Pi Device: RASPBERRY PI ZERO 2 W
- Operating System: RASPBERRY PI OS (LEGACY 32 -BIT) - BULLSEYE
- Storage: YOUR MICRO-SD CARD

Make sure you pick the Debian Bullseye OS. The Debian Bookworm version will work, but this guide was written for Bullseye.

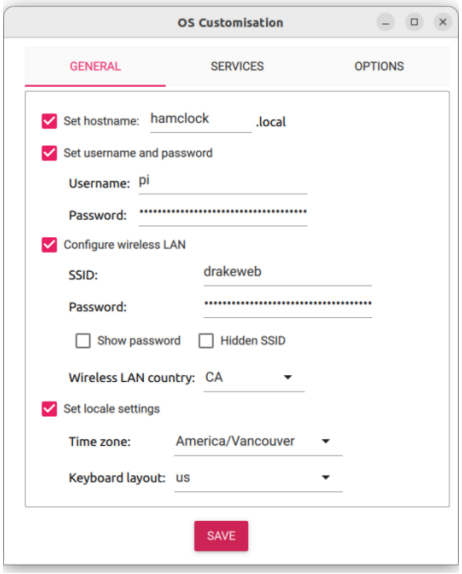
After clicking NEXT, the software will ask you if you want to edit the OS customisation settings. Yes, you absolutely do!

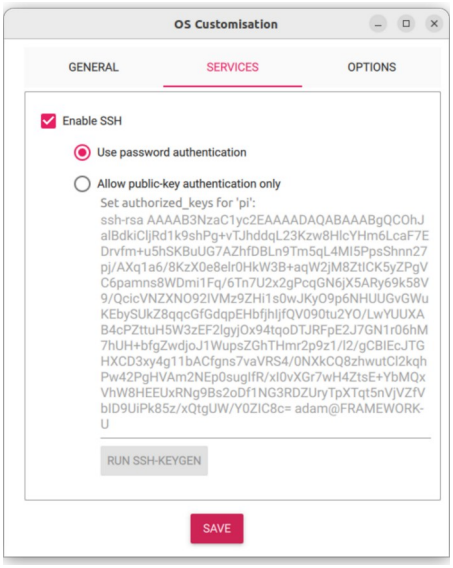


These settings are important, as you'll need to configure the Pi to accept communications via your network, as you're going to build it "headless" (without a screen, keyboard, or mouse).

On the GENERAL tab, make sure you set the following:

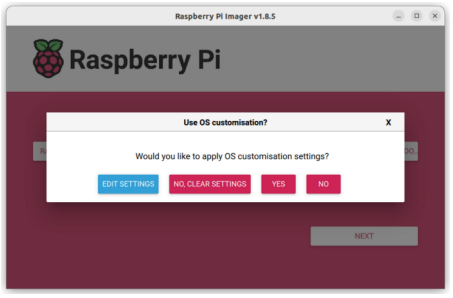
- Set the hostname to "hamclock"
- Set the username and password - IMPORTANT! Use "pi" (lowercase) as the username. It'll save you much heartache later on.
- Configure your home WiFi network
- Set the locale to wherever you live





On the SERVICES tab, make sure you enable SSH and select "Use password authentication". This is vital so you can connect to the Pi over your network.

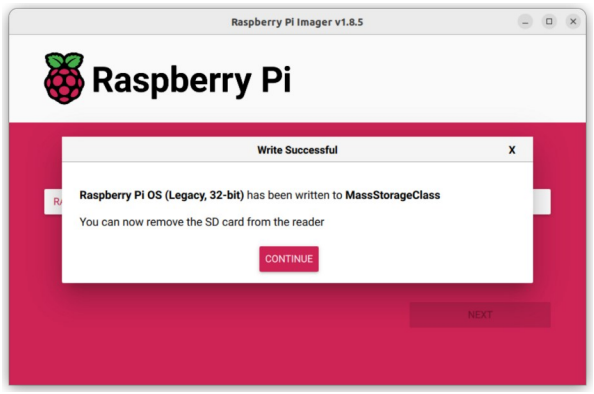
You do not need to set anything on the OPTIONS tab, so just click SAVE.



Next, click YES to apply the settings:

You'll get a warning about the complete erasure of the micro-SD card. Click YES, and sit back for a few minutes while it writes the OS to your micro-SD card. This is the perfect time to enjoy your coffee!

Once written and verified, you'll get the following message:



Time for Step 2!

Step 2 - Powering up the Pi and connecting to it via SSH

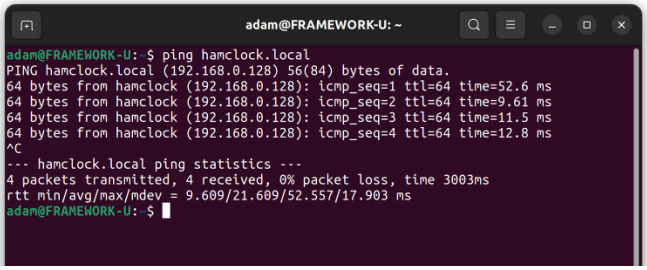
Your next job is to insert the micro-SD card into the Pi Zero, put some power on it, and wait for it to boot. I connected it to a USB port on my laptop., but note that this is for power only. The Pi communicates via WiFi.

Wait a minute or two, then open up a terminal window and check that the Pi has booted, and is visible on your network.

I'm using Linux, so my terminal looks like this, but you can do similar things with similar commands on both Windows and MacOS.

Type:

ping hamclock.local

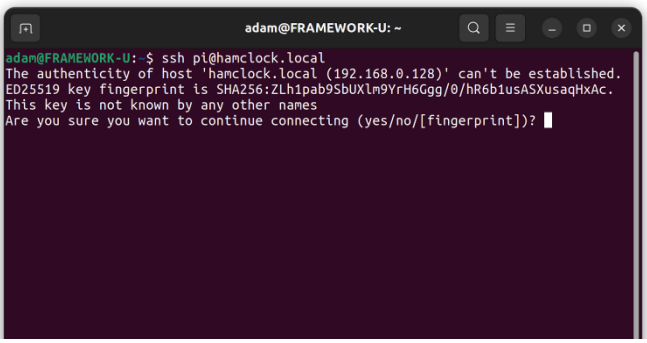


Pinging hamclock.local (remember when we named the Pi on the OS customisation page before imaging the Pi OS?) shows us that it is connected to the network and replying to pings. We can also see that it received its IP from my router's DHCP server - 192.168.0.128.

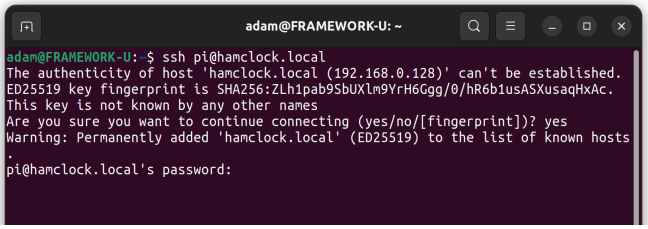
(When you ping Hamclock.local the first or even second time, it might return nothing or an error. Try it a couple of times, as information has to travel between your computer and the router for it to recognise the name and associate it with the right IP.)

Now that we can see the Pi, it's time to connect to it and start to configure it to run HamClock. For this, we need to use a command called SSH (Secure Shell):

ssh pi@hamclock.local

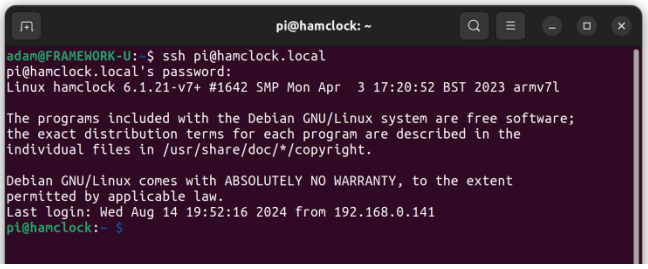


The first time you connect via SSH, it will ask for you to authenticate hamclock.local. Type "yes" to continue. You will then be asked to logon, using the password you set up on the Pi OS customisation page *[below]*.



Type in the password, and you're in!

Any subsequent times you logon to the Pi, you won't be asked to authenticate hamclock.local. A standard logon will look like this *[below]*.



Ok, we're in and connected to the Pi! Time for step 3.

Step 3 - Updating the Pi OS and configuring the system

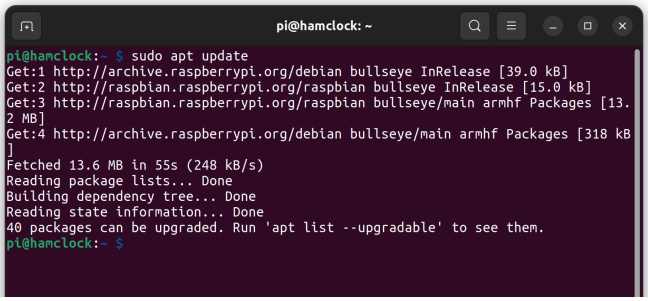
Because we're now working directly with the Pi, and it's using the Debian OS (Linux), the following section should work no matter what computer you're using, as you've just got a window directly into the Pi's OS.

Let's start by updating the Pi OS:

Start by typing:

sudo apt update

And let it do its thing. This command checks the main OS repositories for updated files, then makes a list of all that need updating *[top next page]*.

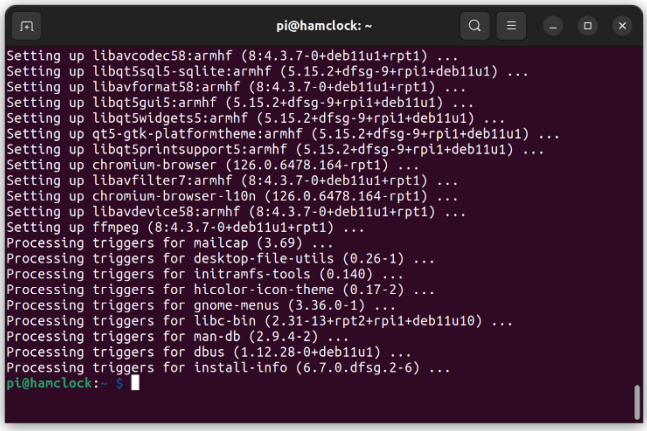


Next, let's update those files:

sudo apt upgrade

This will give you a list of all the files that are ready to upgrade, and asks your permission to continue. Just press [ENTER] and it'll get to it. This upgrade process may take a few minutes, and it'll be updating plenty of files you won't need, but it's easier than trying to work through exactly what you will need, so just let it do its thing.

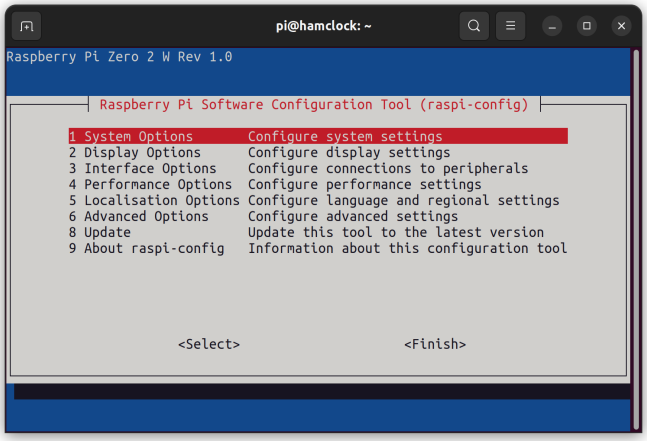
Mine took a few minutes to go through the whole process, but here's it finished *[below]*.



Now it's time to configure the Pi to work as a webserver, but nothing else. We want to minimise the amount of unnecessary processes it's running. We can do that by typing the following:

sudo raspi-config

That will give us this screen:



Rather than giving you screenshots of every setting that needs to be changed, I'll just list them below:

Configuring the Pi to text console only (no graphical screen, as there's no monitor attached):

- With System Options selected, press TAB to go to <Select> and press [Enter]
- Arrow down to S5 Boot / Auto Login, press TAB to go to <Select> and press [Enter]
- Select B1 Console (should be the default), press TAB to go to <OK> and press [Enter]
- You will return to the main menu

Confirm that SSH is enabled:

- Arrow down to Interface Options, press TAB to go to <Select> and press [Enter]
- Arrow down to I2 SSH, press TAB to go to <Select> and press [Enter]
- Make sure YES is selected and press [Enter]
- You will get a confirmation screen, then be returned to the main menu

Confirm VNC is disabled:

- Arrow down to Interface Options, press TAB to go to <Select> and press [Enter]
- Arrow down to I3 VNC, press TAB to go to <Select> and press [Enter]
- Make sure NO is selected and press [Enter]
- You will get a confirmation screen, then be returned to the main menu

There are many other configuration settings that can be changed with this config program, and if you add extra functionality to your Pi (cameras, sensors, buttons, screens etc.) this is the place to enable or disable their functionality. For our configuration, however, there's nothing more to do.

When you quit the raspi-config program, it will reboot your Pi, so you'll need to connect again via SSH.

Time for the next step!

Step 4 - Installing HamClock

As mentioned at the start of this article, all these instructions were from Elwood Downey's excellent website: https://clearskyinstitute.com/ham/HamClock/

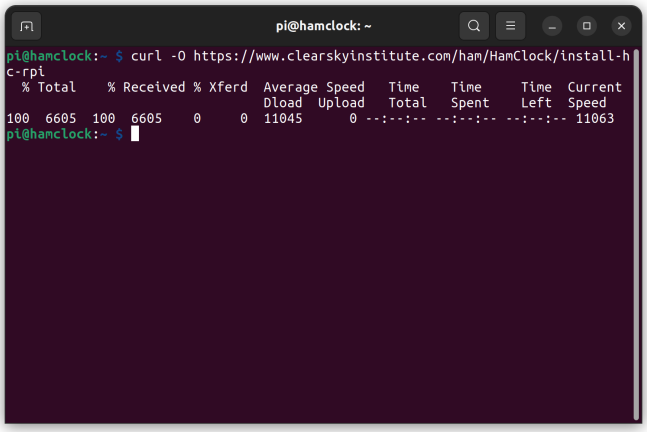
Having reconnected to your Pi via SSH, type:

cd

Then copy the following line:

curl -O https://www.clearskyinstitute.com/ham/HamClock/install-hc-rpi

Now paste it into your SSH session. Depending on what computer you're using to connect to the Pi, your paste function may be different. On Ubuntu, I can either type <CTRL><SHIFT>V, or right-click with my mouse over the SSH window and select Paste. Once pasted, press [Enter] and you should see this:



This has downloaded the install file for HamClock. We now need to change its attributes to allow it to run, then run it. Type the following:

chmod u+x install-hc-rpi

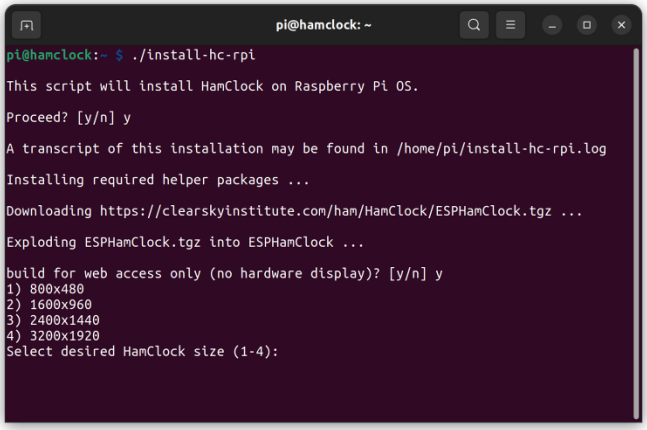
Then:

./install-hc-rpi

IMPORTANT: notice the dot before the / in the last command. That is vital!

You should now get a line telling you that you're about to install HamClock, and asking if you want to proceed. Type "y" and let's get this show on the road!

The program will now download all the files it needs, and then ask you if you want to build for web access only:

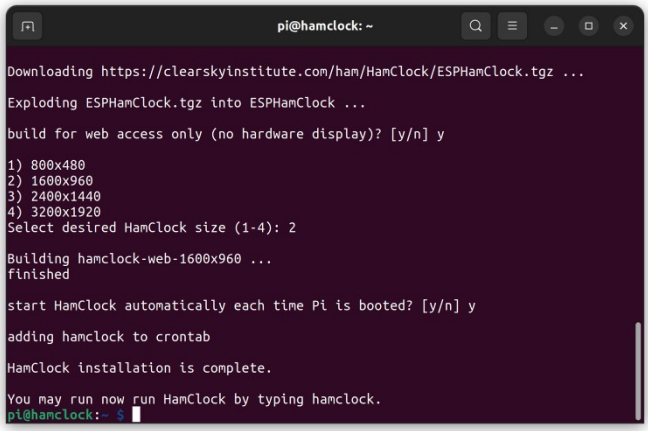


Press ***"y"*** to continue, then select the screen size you require. I recommend choosing:

2) 1600x960

As I find this is the optimum browser size for viewing on full screen, and also for shrinking to a smaller window if required.

Once the install script has configured everything, its final question is whether you want HamClock to start each time the Pi is booted. Answering "y" will configure the OS (using a function called crontab) to load HamClock every time it boots. You should see a confirmation screen like the one on the next page:



Step 5 - Testing and configuring HamClock

To test HamClock for the first time, type:

hamclock &

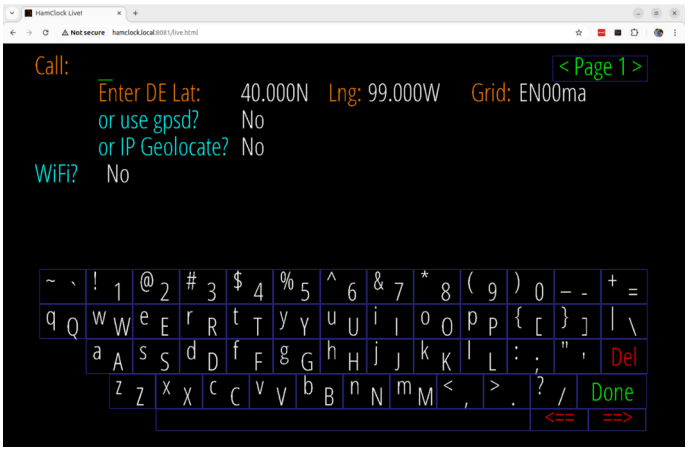
HamClock is now running on your Pi as a webserver! It's time to view it on your computer.

Go to your favourite browser (I use Chrome) and in the address bar, type:

hamclock.local:8081/live.html

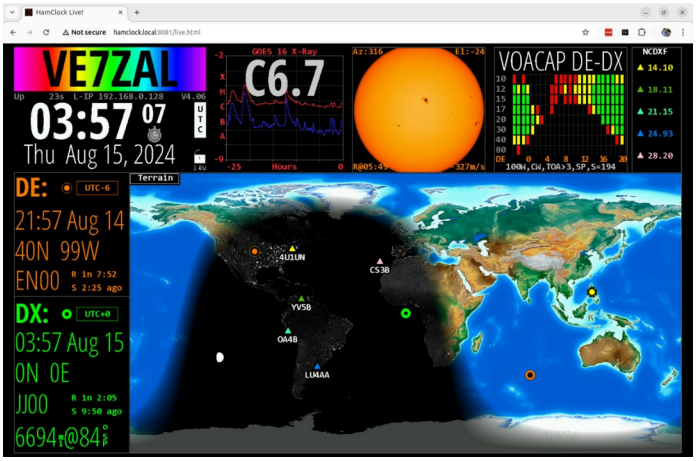
If everything worked properly, you should see the HamClock initial configuration screen:

Enter your callsign. You can leave the WiFi section



as "***no***" because the software will access the Pi's WiFi configuration details automatically. Now just press "***Done***".

After a bit of thinking, HamClock should display something similar to this:



Configuring Hamclock

I have absolutely no intention of explaining how to do this! My job was to get you to this stage - you're on your own now! Well, actually, that's not true. Elwood has an extremely comprehensive user guide which can be found here: https://clearskyinstitute.com/ham/HamClock/HamClockKey.pdf

Step 6 - Relocating and enclosing your Pi

Now that you've got your Pi configured and running HamClock as a webserver, it's time to relocate it to somewhere discrete and sensible. My router has USB ports on it, so I'm just using one of those to power my Pi. It's tucked out of the way, behind a plant. You wouldn't even know it was there.

Obviously, you may also want to enclose your Pi to protect it from dust and errant fingers or animal paws! I prefer passive cooling, and found an excellent and very cheap Aluminum Pi Zero case on Amazon. There are plenty of cases to choose from, so pick something that works for you.

Conclusion

I hope you've enjoyed this walk-through and that you can be successful in your installation of your very own HamClock webserver. Good luck!

~ Adam VE7ZAL
ve7zal@gmail.com

HF Radio:

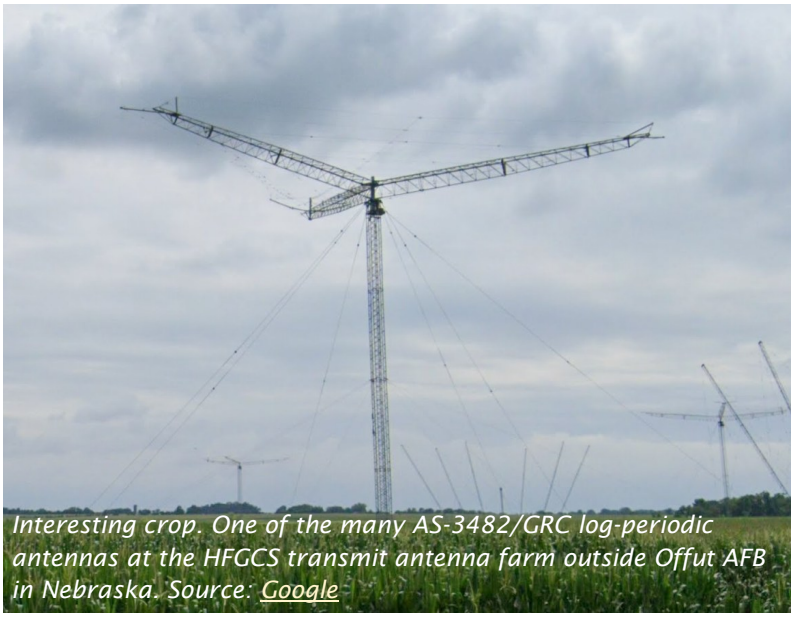
A Crucial Backup for Strategic Forces

Based on an article by DAN MALONEY N7DPM

I'm a fan of Dan's writing, mostly gleaned from HACKADAY. He wrote a recent article about HF radio's capability to connect globally without fixed infrastructure, which makes it ideal for communications for us amateur radio operators, but also as backup for strategic forces. However, it's not foolproof, as interference with ionospheric skip can disrupt its function. This limitation is a key reason why the High-Frequency Global Communications System (HFGCS) serves as a backup rather than a primary method. For HFGCS to become primary, significant failures must occur, such as during an all-out nuclear exchange.

In such a scenario, the United States' 450 Minuteman III ICBMs would be crucial. These missiles form one leg of the U.S. nuclear triad and are kept ready in 45 missile alert facilities (MAFs) across the American prairie. Each MAF includes ten launch facilities, each with an LGM-30 missile in an underground silo, and a separate launch control centre (LCC). The LCC is an underground bunker staffed by two Air Force officers responsible for launching their flight of missiles upon receiving the coded order from US Strategic Command, usually via primary secure networks.

Should these primary links fail, each LCC is equipped with an HFGCS link. Given that LCCs are potential targets on the day of a nuclear exchange, standard HF antennas, which are large and exposed, would likely be destroyed. To address this, LCCs are equipped with hidden HFGCS antennas that can be deployed on command, ensuring the ability to receive launch orders even under extreme conditions.



Interesting crop. One of the many AS-3482/GRC log-periodic antennas at the HFGCS transmit antenna farm outside Offut AFB in Nebraska. Source: Google

The robust design of HFGCS infrastructure reflects its critical role. For instance, blast covers protect HFGCS transmit antenna silos at Minuteman LCCs. Additionally, hardened radomes protect UHF satellite links, highlighting the emphasis on resilience and survivability in the face of potential attacks.

HF radio remains a vital component of strategic communications, particularly as a reliable backup system. Its ability to function without fixed infrastructure and its integration into critical facilities like the Minuteman LCCs underscore its importance. While not infallible, HF radio's strategic implementation ensures that even in the worst-case scenarios, essential communication links remain operational.

~ You can read the entire story, with history and photos on HACKADAY

Tips

Sell off those over priced, expensive, cheap sounding matching speakers!!!

...and keep the cash!!

Instead of using those expensive matching speakers for your HF or mobile rig. Head out to your local thrift store and buy a used 'centre speaker' from a home theatre. Those speakers are designed for voice. They come in various sizes. Ninety percent of them are rectangular in shape. They usually contain at least one or more speaker inside. They sell for a couple of bucks, usually under $10 and the audio is amazing ! So anytime Im near a thrift store, Ill head in to see if they have any. That's all I use now in my shack. I've even made an A/B switch so I can make a direct comparison between speakers. There is no better way to see what works for you, and there is a difference. Some work well on SSB and others CW, and some on both. I try to stick to the name brands, like Sony, Panasonic, and Kenwood. If you find the higher end brand names, grab those for sure !
I keep the ones that I like and pass the others along to club members at the next club meeting or coffee meet for them to try out. Let me know how you make out, and have fun doing it !

~ 73 Mike VE3MKX

QRP CW Transceiver

by SEBASTIAN MUELLER YO6DXE

Pititico, a QRP CW transceiver designed by PY2OHH. One of the smallest and simplest transceivers designed around a single 2N2222 transistor

The Pititico CW transceiver has a consumption in RX of 1.5mA and a power of about 700mW. With a few modifications and using other transistors, the power can get as high as 1W. Depending on the transistor used, you must keep an eye on it so it will not overheat. I also used 2N3904 transistors with good results. I prefer the TO18-3 (metal can) 2N2222A transistor as I can use it with a small heatsink.

The schematic

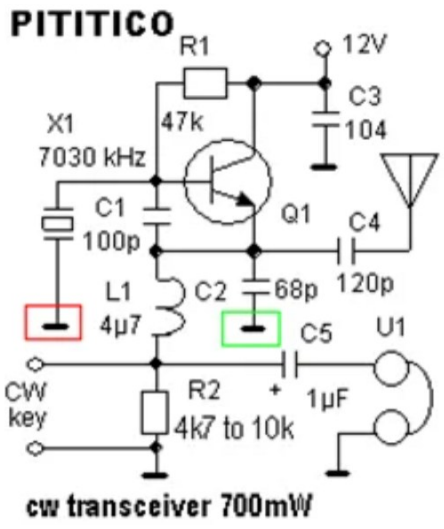
I found the original schematic designed by PY2OHH long time ago and I always wanted to try it. I built a few versions using various schematics I found online. The original version following the PY2OHH schematic, is in the video presented on the bottom of the article. I liked the original version as well, but I had a lot of AM broadcast band interference, it needed a low pass filter and I found it really hard to adjust the offset frequency. So I ended up making a few modifications.

The one described here in the article (Fig. 1) is close to the original schematic, but with little improvements. In the video I also had some LED's and a buzzer that I removed later on. I wanted to reduce the power consumption. A big Thank you to Miguel (PY2OHH) for helping me understand the circuit and fix some of the issues. One day I hope to have you in my Logbook Miguel. Thanks for all the help.

Schematic description

On RX the circuit works as a direct conversion receiver, where the 2N2222 acts as oscillator. The 10K resistor limits the circuit current to 1.5mA.

The trimmer capacitor C3 will set your offset frequency. The trimmer capacitor C4, will help you adjust the TX frequency exactly on 7.030MHz.



Pititico Original Schematic by PY2OHH

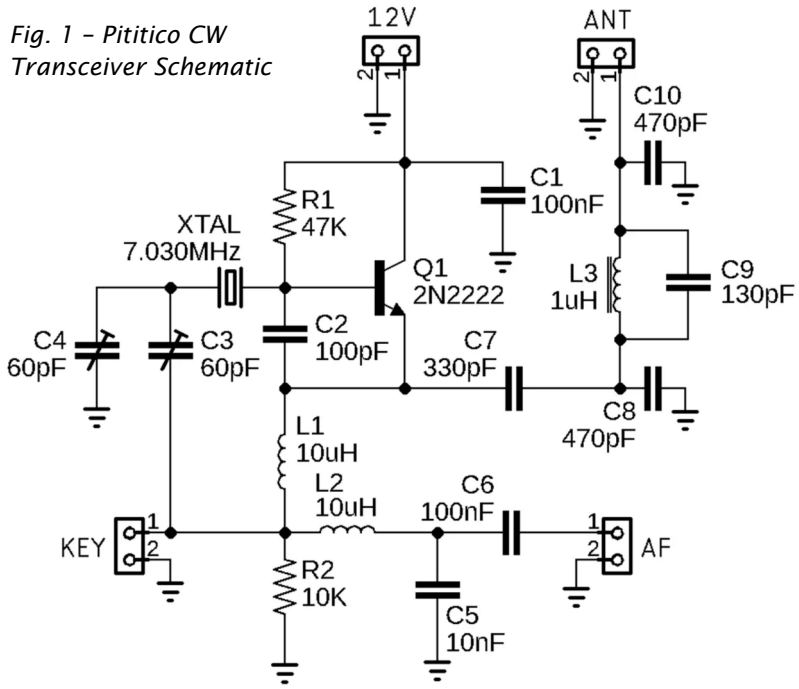


Fig. 1 – Pititico CW Transceiver Schematic

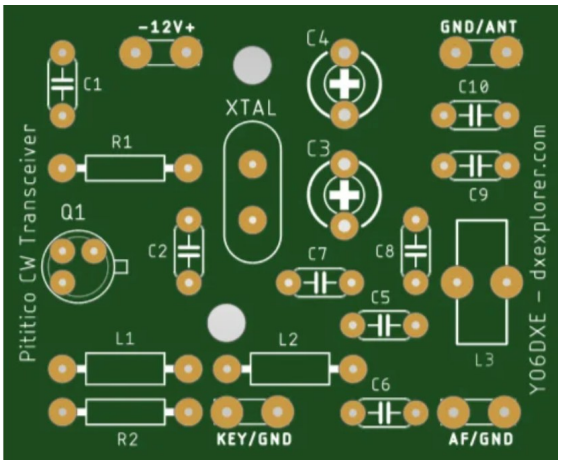


Fig. 2 - Pititico CW Transceiver PCB Board

Otherwise the transceiver would transmit around 7.029Mhz. You can also replace them with a fixed value capacitor instead if you want.

In my case for example, having C3 – 33pF and C4 – 10 pF offered me a TX frequency of 7.030MHz and an offset frequency of around 800Hz. I find it a lot easier to use two trimmer capacitors instead and adjust them. It's not a perfect solution and you may have to go back and forward adjusting them until you get it right. But is a simple and easy solution. This is also the reason why I kept it on a fixed frequency and I am not using a VXO.

In TX the circuit works as a low power oscillator, reaching 1W and currents of 100mA. The transistor supports this current well in CW, but do not keep the CW key activated too long as the transistor will burn out. Another problem is operating without antenna or dummy load, the transistor burns out right away.

The capacitor C7 should be between 120 to 150pF. I changed the value to 330pF increasing the power of the transceiver to 700mW. I also placed a modified Pi Network filter on the output that that improves the harmonics suppression. In the past and in the videos I was using a modified Pi Network filter that acted like a bandpass filter. It was a nice solution, but on transmit a bandpass filter is not a great solution. I tried at that time to remove the AM broadcast band interferences and that was the best I could do back then with the knowledge I had at the time. Now I am a lot happier with the results of the updated version.

To remove most of the AM broadcast band interferences I added C5 together with L2. L2 is important to separate the audio output from the oscillator. With ought L2 the TX frequency and the offset frequency would not work properly. So far it seems that I have very little interferences and I am happy with the result.

Pittitico CW transceiver PCB

I built my Pititico CW Transceiver in a small wooden box initially using the Manhattan style construction for the circuit. I also made a PCB design that you can use to make PCB boards using the toner transfer method. Unless you want to order the PCB boards from PCBWay as I do as it turns out really nice at the end and looks way better too.

Building the Pititico CW transceiver

To listen to the audio output, you should use a 300 Ohm phone speaker as Miguel (PY2OHH) recommended. It didn't work for me, maybe I used the wrong speaker. Even better is a high gain audio amplifier. I'm using an LM386 amplifier set to the highest gain possible. If you do not want to use an external amplifier, I would recommend you to try building Pititico II, that has the audio amplifier included in the circuit. Is a lot like a Pixie transceiver, more or less.

As you can tell, this is not exactly my prettiest built, but it works perfectly. I wanted to test it before designing the PCB board. I really loved the wooden enclosure I had and I wanted to keep it like this. In the video down below is an older version. It worked fine but I still had AM broadcast band interferences. On the new version I built, I also moved the crystal on the

top panel so I can change the crystal for other (40m band) frequencies. Now this transceiver belongs to my friend Andrei - YO6TJJ as I offered it to him as a gift. More like a nice memory between friends.

Adjusting the low pass filter

The inductor that I made for the bandpass filter was made on a T37-6 toroid. It has 16 turns of 0.35mm enameled copper wire. Calculated using toroids.info for the value of 1uH it should be 18 turns instead. For me 16 turns offered me the best power output and the filter performs well. To adjust the filter once you finished building the transceiver, simply connect the transceiver to a a power meter and spread or tighten the turns on the toroid for the highest output power. With a 2N2222 transistor with an hfe of about 240 the output power in my case is about 700mW. It depends on the transistor you are using and the amplification factor of the transistor.

Initially the bandpass filter helped me get rid of most AM broadcast band interferences that I used to have in the older version I built in this video. Now in the latest design with the actual low pass filter the results are much better both with the AM broadcast band interferences and the harmonics suppression.

David (DL1DN) from QRP Lifestyle built a modified version for the 10m band, so feel free to do modifications for other bands as well. I hope you like this project as much as I do. Now all I have to do is to learn the Morse code and get on air using CW on this tiny QRP transceiver that I absolutely love. I just need to find the right telephone speaker to really use it as a one transistor transceiver. This should be fun indeed. I may return with an instructional video at some point using the latest design. Sometimes simple things are harder to adjust, especially for beginners.

73,

~ SebatianYO6DXE

Tiny Transceiver Gets It Done With One Transistor |

[Top] Fig. 3 - Pititico CW Transceiver (older version)

[Centre] Fig. 4 – Pititico Wooden Enclosure

This project can be done with fixed values for C3 and C4. You can replace them with a fixed value capacitor instead. In my case for example, having C3 – 33pF and C4 – 10 pF offered me a TX frequency of 7.030MHz and an offset frequency of around 800Hz. I find it a lot easier to use two trimmer capacitors instead and adjust them. If you use fixed values, you may have to make little adjustments in the value of each capacitor. Sometimes the results may differ depending on the transistor used.

[Below] Click to play the video of the DX Explorer - Pititico QRP CW Transceiver Designed by PY2OHH

No-Ham Recipes

Thai chicken

by ELIZABETH VE7YL

Elizabeth says, "l leave out hoisin sauce and the hot pepper sauce and use Indonesian ketsup manis instead of soy sauce."

Hoisin sauce, Indonesian ketsup manis and toasted sesame oil can be found in Asian foods stores, many large supermarkets and whole foods stores. Try them! They add interest to many foods, including western foods.

FILLING:

- 2 tablespoons (30 ml) fresh flat-leafed parsley, chopped
- 8 chicken thighs

SAUCE:

- 1/3 cup (90 ml) whole green onions, chopped (Set aside half to use as garnish)
- 2 garlic cloves, finely minced
- 1 tablespoon (15 ml) fresh ginger, peeled and finely chopped
- 1 tablespoon (15 ml) lemon juice
- 2 tablespoons (30 ml) peanut butter
- 1 tablespoon (15 ml) toasted sesame oil
- 3 tablespoons (45 ml) hoisin sauce
- 1 tablespoon (15 ml) soy sauce
- 1/2 teaspoon (2.5 ml) hot pepper sauce

Set oven to 375F (190C or a moderate oven)

SAUCE:

Combine half of the green onions with all the other sauce ingredients. Mix with a whisk until sauce is well mixed.

FILLING:

Arrange chicken in shallow baking dish in a single layer. Pour the sauce over chicken thighs, making sure that each piece of chicken is thoroughly covered in sauce. Sprinkle with green onions and parsley after placing on large serving dish. Bake for 40 to 50 minutes until chicken, when cut, no longer releases pink juices.

An optical SWR indicator

Ideal for POTA

by VERON PI4RAZ

Many (especially newer) sets generally have a built-in SWR indication, but in DIY kits an external SWR indication (and possible tuning) is often counted on. There are plenty of designs with one or two meters that indicate the SWR, but those types of devices are usually relatively large compared to the portable QRP sets, and meters can be vulnerable during transport to the preferred location for QRP work. The SWR indicator described here is not equipped with meters, but with two LEDs: a green one for the Forward indication so that you can see that power is going to the antenna, and a red LED for the Reflected indication, as a sign that the antenna used is not optimal. *[See the diagram on the next page].*

The HF is passed through an FT3743 toroid *[Amazon 10 for US9.50]* that is equipped with a bifilar winding with 10 turns. Bifilar means that the wires are laid simultaneously, slightly twisted, around the core. 1- 3 is a winding, and 2 - 4 is the second winding. For the rectification, ordinary 1N4148 silicon diodes are used, where you might usually see germanium diodes such as the 1N34 used in these types of SWR bridges. For this application, the silicon diodes are sufficient. After all, you need at least 2 Volts for the green LED to light it up and whether 0.3 Volts are lost over the Germanium diode or 0.7 Volts over the Silicon diode doesn't make a difference.

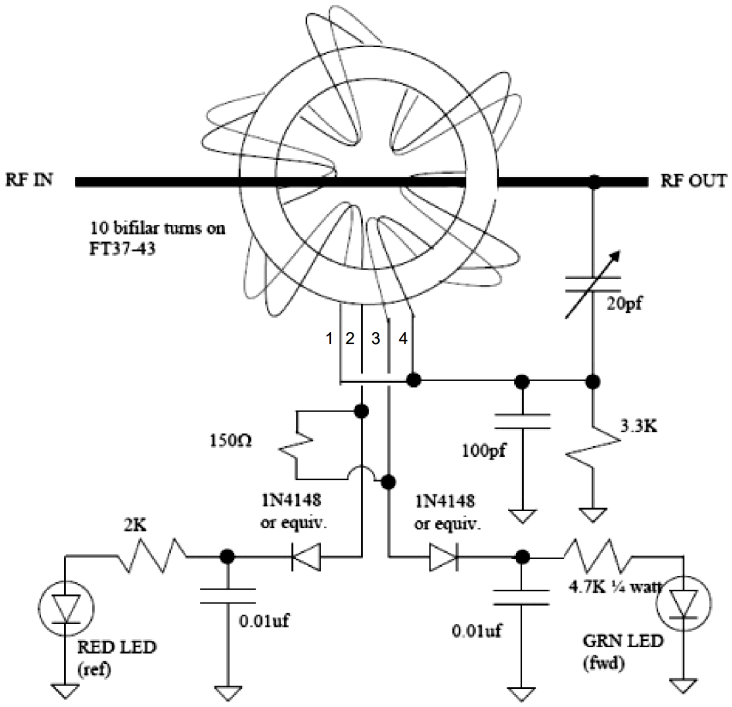
The adjustment is not complicated:

Connect a dummy load and adjust the trimmer in such a way that no reflected signal is displayed (red LED off). The construction will not cause any problems either: You can easily put the few parts on a piece of experimental board or double-sided circuit board according to the 'Dead Bug' or 'Manhattan' method *[see next page]*. The whole thing fits easily in a small box and can be a welcome addition to the portable set or holiday setup, for example with the increasingly popular JPC12 antenna (also known as Pac12 at AliExpress). This antenna has an extension coil and works from 40 to 6m by tuning the coil and/or extending or extending the telescope antenna, in

combination with the extensions. Ideal for portable or holiday use, and with the help of this optical SWR indicator you can quickly see if the antenna is properly adjusted. But there are probably more applications where this indicator can be applied, for example in combination with a simple tuner *(next issue)*.

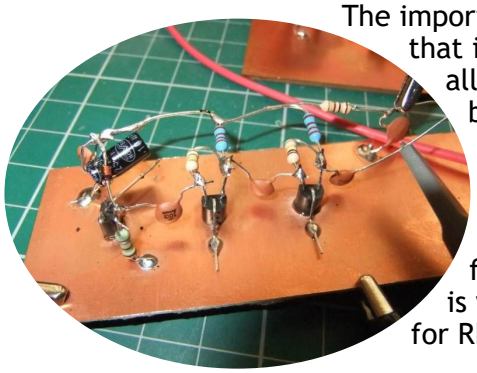
~ Translated from the Radio Amateurs Zoetermeer newsletter: razzies202408.pdf (pi4raz.nl)

~



There's a Dead Bug in My Circuit

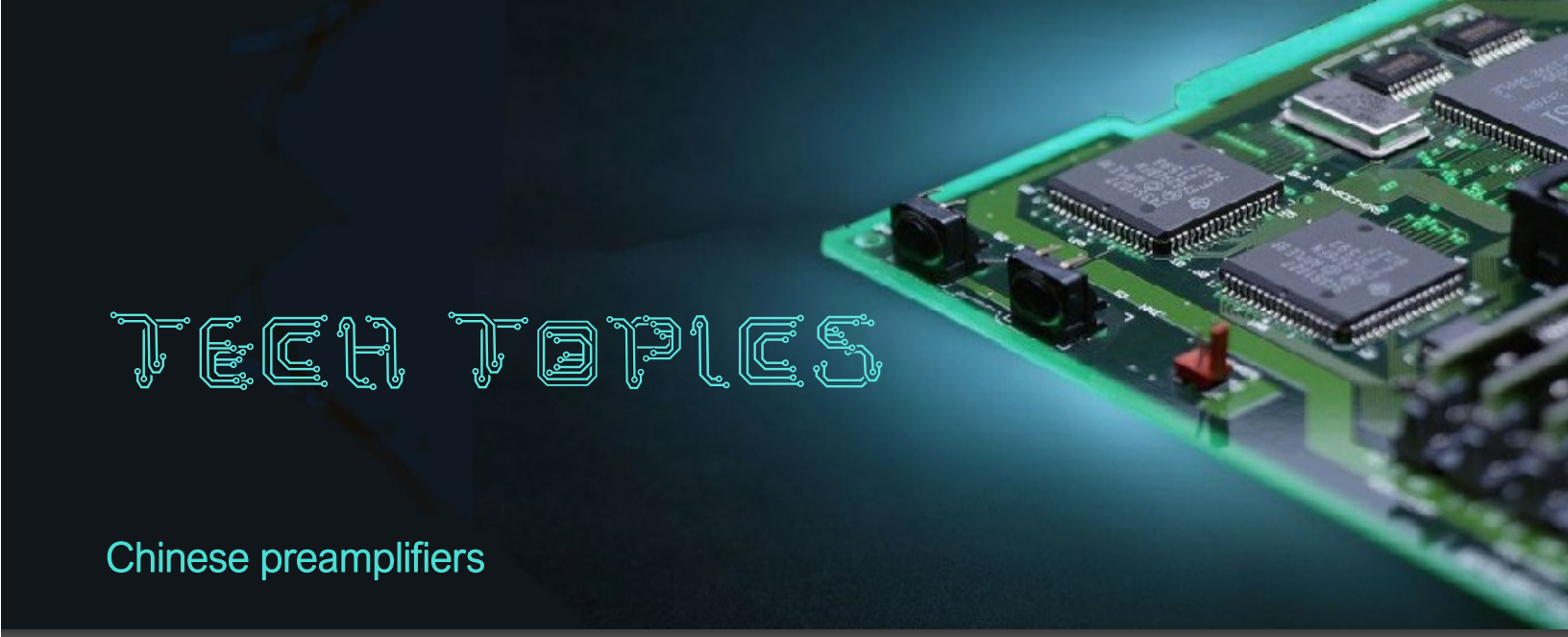
As you can imagine, Ugly works best for circuits that mostly use discrete components. After all, it's got to be difficult to tack a 14-pin DIP down to a board, right? Enter the "Dead Bug" style of Ugly. As the name implies, Dead Bug builds have components with all the leads sticking up in the air like a dead bug. Sometimes the DIPs and other components are glued to the board for mechanical stability with a dab of superglue. The important point, though, is that interconnections still all occur above the board, and ground connections are short, direct and many. That huge ground plane is a key feature of Ugly, which is why it's so often used for RF circuits.



Another benefit of Ugly is the reduction of stray capacitance. Solderless breadboards are great prototyping tools, but there's no escaping the fact that a grid of long, parallel conductors spaced 0.1″ apart and separated by a dielectric is going to have capacitance. It's not a lot, and it's not a factor for every circuit, but a couple of picofarads here and there can add up to a problem. With short leads and no long parallel traces, Ugly minimizes stray capacitance and is another reason a lot of RF circuits use it.

Getting Ugly, Dead Bugs, And Going To Manhattan | Hackaday

~ Dan Maloney



TECH TOPICS

Chinese preamplifiers

by JAN VANDERMEIJ PA0JMY

When surfing on the Internet, a lot of very nice, very low noise preamplifiers can be found for a very reasonable price. In the latest ones, sophisticated transistors or FET's are used, providing high gain and low noise, even on higher frequencies.

I purchased some of these amplifiers and tested them with my, limited, noise measuring system.

Measurement setup

In the past I made a CANFI (http://www.canfi.eu/) but the results were not very satisfactory. I also own a Signalhound spectrum analyser, BB60C *[shown right]* and with this instrument, the Spike software and a noise source, it is possible to measure the gain and the noise factor of an amplifier.

As a poor radio amateur I cannot afford an expensive 346B noise source from HP but I bought an RFD 2305 from RF Design in the UK *[below left]*.

To make measurements possible, the noise source is calibrated and the calibration table (ENR table) is provided with each device. I do not know if the noise sources are still available but you can look to the website g8fek.com.

I measured the gain and noise figure at fixed frequencies and taking an average over 25 samples.

Reference

Of course it is important to know what you are measuring and therefore I used a Mini Circuits amplifier: ZKL-2R7. This amplifier is well documented *[Table next page]*.

On 144.3 MHz, I measured a noise figure of 4.36 and a gain of 24.52 dB. That seems to be good. Let's try 1296.3 MHz: noise figure 4.80 dB and 25.48 dB gain.

FREQUENCY (MHz)	GAIN (dB)			DIRECTIVITY (dB)			VSWR (:1)		NOISE FIGURE (dB)	POUT at 1 dB COMPR. (dBm)
	9V	12V	13V	9V	12V	13V	IN	OUT	12V	12V
10.00	23.43	24.35	24.33	12.93	13.06	13.09	1.19	1.47	5.54	16.51
210.00	23.77	24.89	24.99	12.05	11.69	11.75	1.18	1.36	4.88	17.07
460.00	23.76	24.88	24.97	11.97	11.65	11.64	1.24	1.41	4.97	17.26
710.00	23.77	24.83	24.92	11.97	11.72	11.76	1.32	1.49	5.02	17.66
910.00	23.78	24.80	24.88	12.01	11.85	11.83	1.41	1.54	5.08	17.65
1010.00	23.74	24.73	24.82	12.05	11.81	11.84	1.41	1.57	5.08	17.78
1210.00	23.70	24.66	24.74	11.92	11.83	11.89	1.45	1.56	5.05	17.75
1460.00	23.67	24.61	24.69	12.09	12.01	11.93	1.44	1.49	5.01	17.78
1710.00	23.76	24.72	24.82	11.80	11.57	11.55	1.37	1.37	5.10	17.43
1910.00	23.70	24.69	24.79	11.91	11.56	11.48	1.29	1.25	5.21	17.40
2010.00	23.56	24.59	24.70	12.05	11.64	11.55	1.26	1.17	5.25	17.28
2210.00	23.34	24.41	24.52	12.43	11.85	11.73	1.20	1.06	5.26	17.42
2360.00	23.16	24.18	24.28	12.82	12.26	12.10	1.20	1.09	5.29	17.07
2560.00	22.75	23.72	23.81	13.52	12.96	12.87	1.25	1.21	5.31	16.62
2700.00	22.09	23.09	23.16	14.33	13.66	13.74	1.32	1.30	5.36	16.49

The measurements seem to reliable and according to the Mini Circuits specifications.

Measurement results

4 GHz, 1.9 dB NF

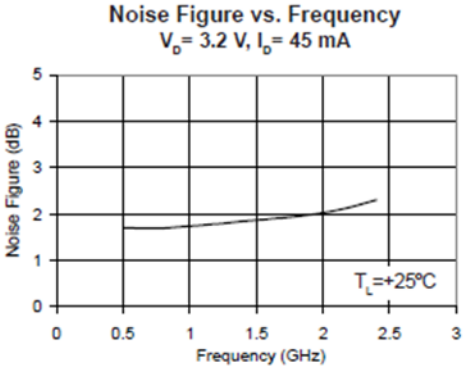
The first amplifier was one in a small box, specified for 50 kHz to 4 GHz and a noise figure of 1.9 dB. The MMIC inside is an RFMD SGA4586Z. The supply voltage is 3.6 Volt. Two resistors of 360 Ohm each in parallel are used for biassing the MMIC.

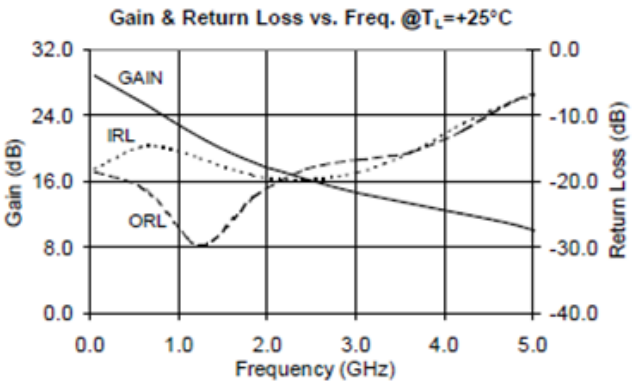
According to the specifications, the noise figure is 1.9 dB for frequencies between 500 MHz and 1 GHz. Below 500 MHz, there is no specification for the noise figure. For 144 MHz the noise figure is at the lowest point: 2.05 but I did not measure over the whole frequency band (only on for us radio amateur interesting frequencies). The amplifier did draw 45 mA at 12 VDC. That is according to the specifications.

Frequency MHz	Gain dB	Noise Figure dB
28	22.23	3.95
50	22.01	3.24
144.3	28.96	2.05
432.2	27.05	2.39
1296.3	22.20	2.61

4 GHz, 0.6 dB NF

I also have a later model amplifier: specified for 50 MHz to 4 GHz with a noise figure of 0.6 dB. This amplifier is equipped with an SPF5189 from Qorvo.





When I look to the specs of this pHEMT MMIC, the noise figure should be lower. This is probably caused by low cost, low quality components used in the amplifier. The gain seems to be as specified.

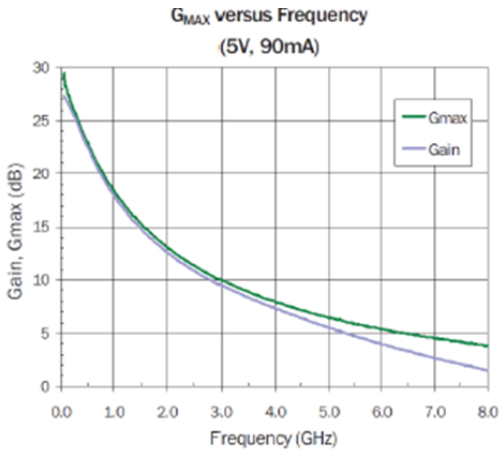
Frequency MHz	Gain dB	Noise Figure dB
28	26.38	1.85
50	26.76	1.19
144.3	26.91	1.05
432.2	23.37	1.26
1296.3	15.93	1.25

Both the SGA4586Z and the SPF5189 are obsolete but the Chinese manufacturers seem to have more than enough in stock: the amplifiers are widely available on AliExpress

When we radio amateurs use a better quality PCB and good quality components (especially capacitors), I think we will be able to improve the noise figure for the boards. Nowadays there are better components available but these are hard to process (for my 70 year old eyes and hands these components are a bit too small). I enjoy playing around with RF stuff and I hope many others do the same.

~ Jan PA0JMY

Frequency MHz	Gain dB	Noise Figure dB
28	22.23	3.95
50	22.01	3.24
144.3	28.96	2.05
432.2	27.05	2.39
1296.3	22.20	2.61



Typical RF Performance on Evaluation Boards

Parameter	0.8GHz	0.9GHz	1.0GHz	1.7GHz	1.8GHz	1.9GHz	2.0GHz	2.1GHz	2.2GHz	Unit
Small Signal Gain	19.6	18.7	17.9	13.8	13.5	12.9	12.7	12.2	11.9	dB
Noise Figure	0.52	0.55	0.79	0.75	0.81	0.83	0.90	0.91	0.98	dB
Output IP3	38.4	38.5	39.0	39.2	39.5	39.5	39.8	39.8	39.9	dBm
Output P1dB	22.3	22.4	22.5	22.6	22.6	22.7	22.7	22.7	22.7	dBm
Input Return Loss	17.1	17.5	17.5	17.5	17.5	18.5	18.5	18.5	18.0	dB
Output Return Loss	16.0	16.0	15.5	14.0	14.0	14.5	15.0	15.5	16.0	dB
Reverse Isolation	24.5	24.0	23.0	18.5	18.5	18.0	18.0	17.5	17.0	dB

Test conditions: VD +5V, ID 90mA, OIP3 0dBm/tone Δf 1MHz, T_{LEAD} +25°C, 50Ω system impedance

A Broadband 100W Linear RF Power Amplifier

for LF, MF and HF Bands

by MARK MATTILA VA7MM and ROGER GRAVES VE7VV

A broadband 100W linear RF power amplifier covering LF, MF and HF radio bands was created by modifying the 1W in, 100W out, 1.8 to 54MHz amplifier designed by Jim Veatch, WA2EUJ that utilizes NXP's LDMOS MRF-101A transistor made for RF power applications. The WA2EUJ amplifier was the first place winner of the NXP design challenge in 2019. The modified amplifier is built utilizing Jim's circuit board, **Figure 1**, with certain components replaced with different values for LF and MF bands and higher performance specification. The output circuit was re-designed by VE7VV for operation down to 136 kHz by using high permeability ferrite material in the output transformer and, since this material must be protected from DC current, separating DC and RF paths by adding an RF choke and DC blocking capacitors.

The new amplifier performs over a wide frequency range from 136kHz to 10.15MHz with 1W of RF drive yielding 100W of RF output. The amplifier was implemented with external low pass filters for the LF and MF radio bands and extensively tested on the bench and on the air, meeting all expectations for performance. Experimental use of the 2200m LF and 630m MF radio bands has been the primary motivation for the project with the amplifier now deployed to provide RF power for weak signal and digital communication experiments.

Design and Assembly

The WA2EUJ circuit board was produced in a type A version dated 7/19 and a type B version dated 9/19. This project utilized the type B version board, **Figure 1**. The WA2EUJ amplifier and board are designed using surface mount components throughout including the output circuit.

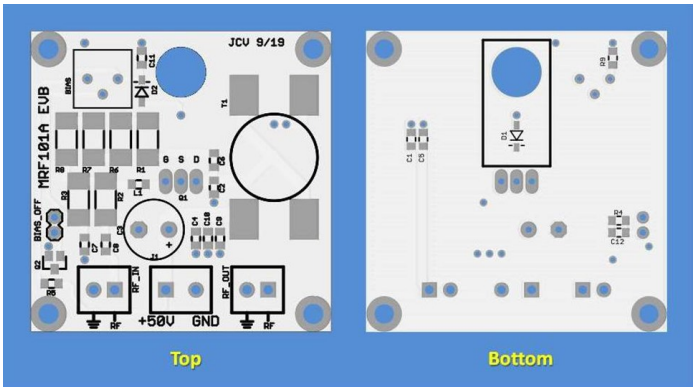


Figure 1: WA2EUJ circuit board version B is a compact 50 x 50 mm SMD design.

Modification of the amplifier to LF and MF bands required component upgrades for which only through hole components were available, **Figure 2**. Custom RF choke and RF output transformer are external to the board, **Figure 3**.

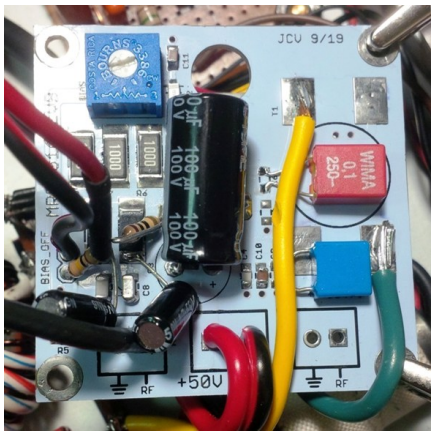


Figure 2: WA2EUJ circuit as modified showing new through-hole components.

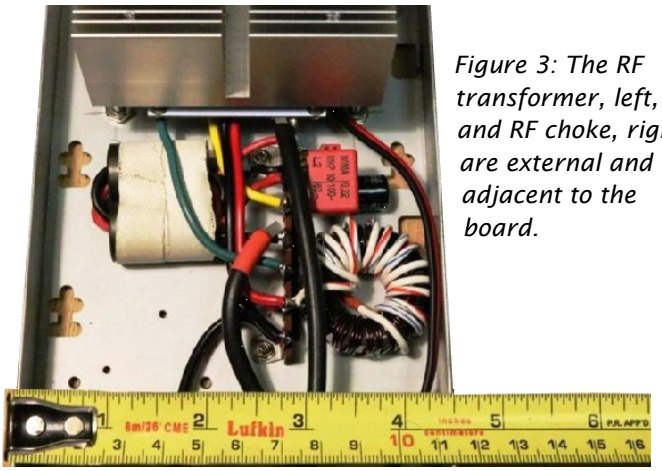


Figure 3: The RF transformer, left, and RF choke, right, are external and adjacent to the board.

The schematic diagram for the modified amplifier and LF and MF low pass filters are presented in **Appendix 1**. The schematic identifies components located on and off the circuit board. The parts list, **Appendix 2**, identifies which components are part of the original HF amplifier design and which are changed by the modification.

The LF and MF amplifier includes a 5V power supply to provide Q2 gate bias voltage. Q2 controls the bias voltage level to MRF101A MOSFET Q1 with level adjustment made using trim potentiometer R10. The Q1 bias voltage is turned on/off for transmit/receive by Q2 with control through the BIAS_OFF connection on the WA2EUJ board. The switching logic, Table 1, is for implementation of the amplifier with T/R switching provided through the send relay connection on an HF transceiver that drives LF and MF transverters. The modified amplifier additionally includes a built in 12V power supply to provide supply voltage for the cooling fan.

Description	RX	TX
T/R Send Relay	Open	Closed
BIAS_OFF Voltage at Gate of Q2	5V	0V
Voltage at Gate of Q1 with R9 at 0Ω (see note)	0V	5.4V
Voltage at Gate of Q1 with R9 at 10kΩ (see note)	0V	0.9V

Table 1: Q1 and Q2 Bias Voltage States

Testing and Performance

Initial testing utilized a dual trace oscilloscope and DVM to measure current and 50 V DC supply voltage. Current was measured by running the DC input line through the meter's current jack.

Initial testing set-up procedure:

- Fuse in DC supply line at 4A
- Monitor Q1 drain on oscilloscope channel 1
- Monitor DC supply current
- Connect low pass filter followed by 50Ω load
- Monitor RF output voltage oscilloscope channel 2
- Set trim pot R9 to ground end for maximum resistance
- Connect drive RF source, off initially, minimum drive

While watching the scope drain waveform and being ready to drop the DC if there is any oscillation or if the drain does not go to steady +50V, turn on the 50V supply.

Assuming no oscillation, and no smoke, and with the drain sitting nicely at 50VDC, slowly increase the bias pot to get the 100 mA resting bias while watching the drain voltage on the scope to see if it might start oscillating when the bias reaches the level where the FET begins to conduct.

If any oscillation is seen, drop the DC quickly and re-evaluate.

If no oscillation, then first making sure the exciter is set for minimum drive, turn on the drive while watching the drain waveform, slowly increase the drive. Stop the increase when the drain waveform Vpp stops increasing linearly as indicated by the output waveform which will change shape and show flattening at the top and bottom.

The drain waveform is more sine wave like when the amp is driving a capacitive (Pi form) input LPF than when driving a dummy load with no LPF.

100W output is 70.7 Vrms, 200 Vpp on a 50 Ohm load. Monitoring input and output RF voltage on the scope an increase on the order of ten times should be observable, **Figure 4**.

If you reach this point, celebrate!

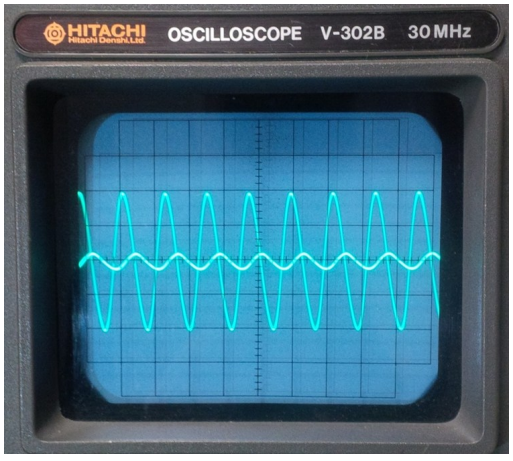


Figure 4: 50V per division scope showing 20Vpp drive and 200Vpp output RF voltages at 137 kHz

Measured supply current at maximum power output is about 3.5 amps at 100W output from the amplifier, **Figure 5**.

The RF power linearity graph, **Figure 6**, indicates very linear performance to about 56W. Beyond 56W input/output begins to deviate from linear behaviour. Linear amplifier maximum power output is often specified as the power at which the output drops to 1dB below the linear line, or "1 dB gain compression", since inter-modulation distortion (IMD) increases markedly beyond that point. Our amplifier's 1 dB compression power occurs at 90 Vpeak RF output into 50 Ohms, which equates to about 80W RF power, **Figure 7**. Interestingly, WA2EUJ chose to report 2-tone IMD spectral analyzer results for his HF version at 80W peak power, which is just the 1dB gain compression point of our version. His plots show the worst products were approximately -40 dB down on the 80m band, **Appendix 3**.

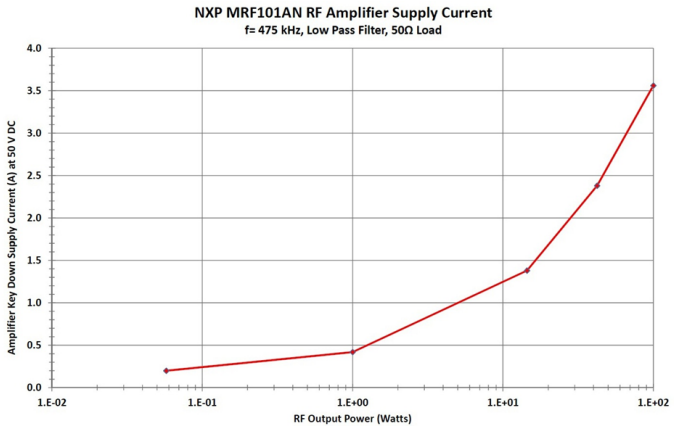


Figure 5: Supply current as a function of power output

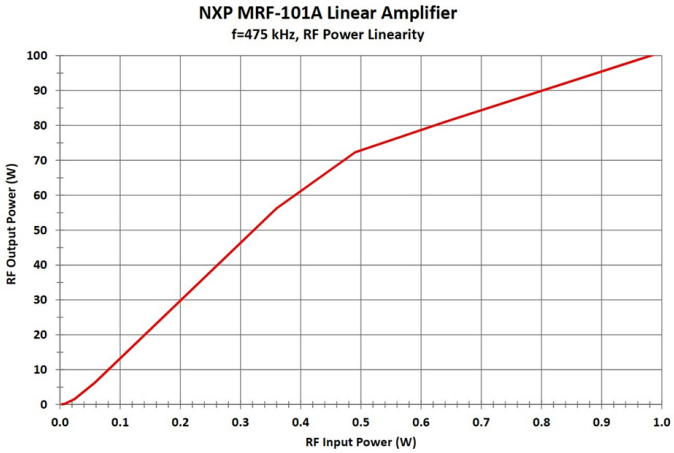


Figure 6: RF power linearity at 475 kHz, 50Ω Load

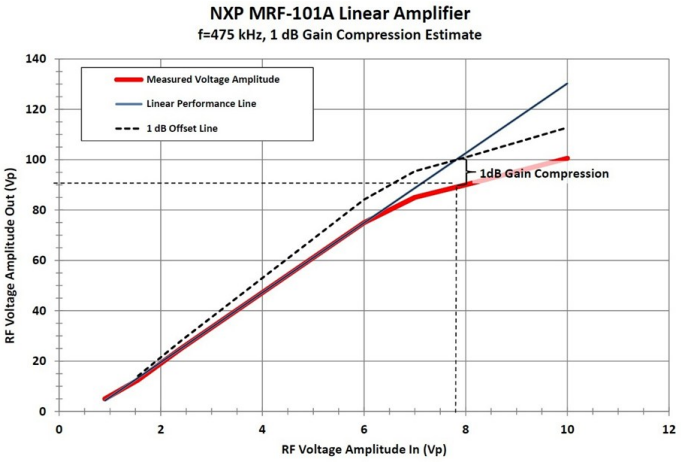


Figure 7: Gain compression at 1 dB occurs at 90 Vpeak which equates to 80W RF power.

Two-tone IMD at -40 dB is considered to be good for an amateur class linear amplifier and significantly exceeds the -30 dB unofficial "standard" used by the ARRL in their test reports. We have not tested 2-tone IMD in our modification, but it could be expected to be similar to what WA2EUJ reported because the active device in both versions is operated with the same negative feedback circuit and at the same 50VDC and 100mA resting bias.

Low Pass Filters

The low pass filters (LPF) shown in the schematic, **Appendix 1**, are a Pi circuit design by VE7VV that specifies capacitors, toroid types and wire size sufficient to handle RF voltage, current and flux values for power up to 200W. Performance of these filters, indicated by measured insertion loss as a function of frequency, indicates second harmonic suppression about 24dB for 137kHz and 30dB for 475kHz, **Fgures 8 and 9**.

The second harmonic content of this single ended amplifier is relatively high as is generally the case for single-ended amplifiers. When combined with LF and MF antenna tuning systems that are typically very high Q, significant additional suppression of harmonics after the LPF is provided. For example, investigation of the Marconi T antenna system at VA7MM estimated for 475kHz the system Q at 25 and the second harmonic suppression at 56 db, **Figures 10 and 11**. When the 30dB attenuation of the LPF is included the total suppression at the second harmonic is about 86 dB.

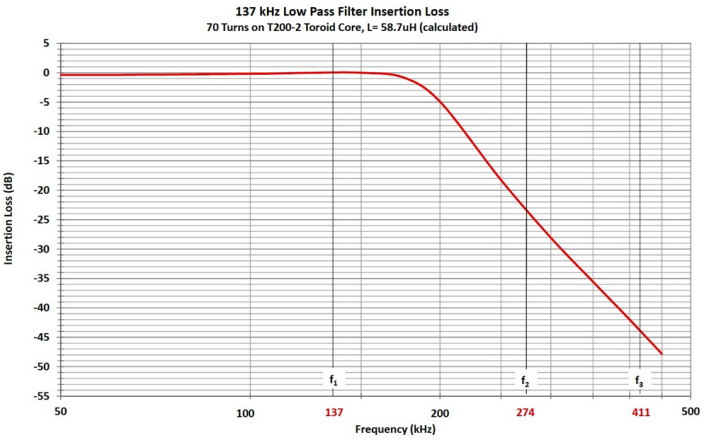


Figure 8: 137 kHz low pass filter measured insertion loss, L= 58.7uH (70 turns on T-200-2)

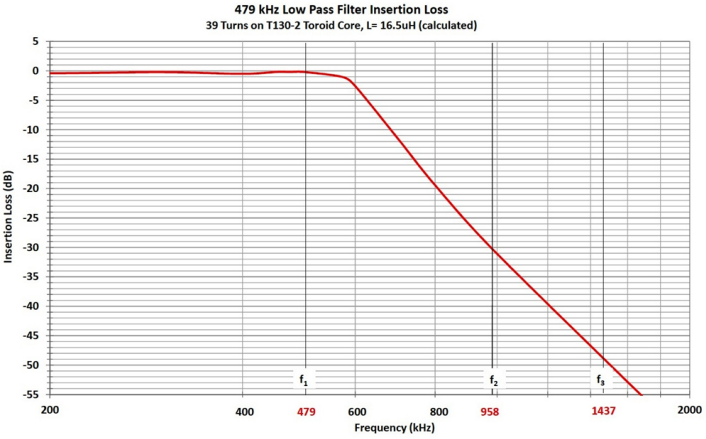


Figure 9: 475 kHz low pass filter measured insertion loss, L= 16.5uH (39 turns on T-130-2)

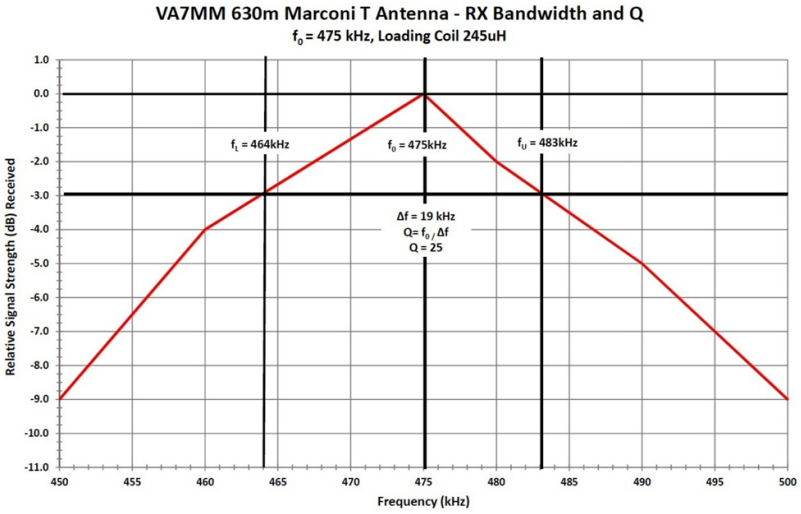


Figure 10: Antenna Q indicated at 25 with 30m high Marconi T antenna and 245uH loading coil.

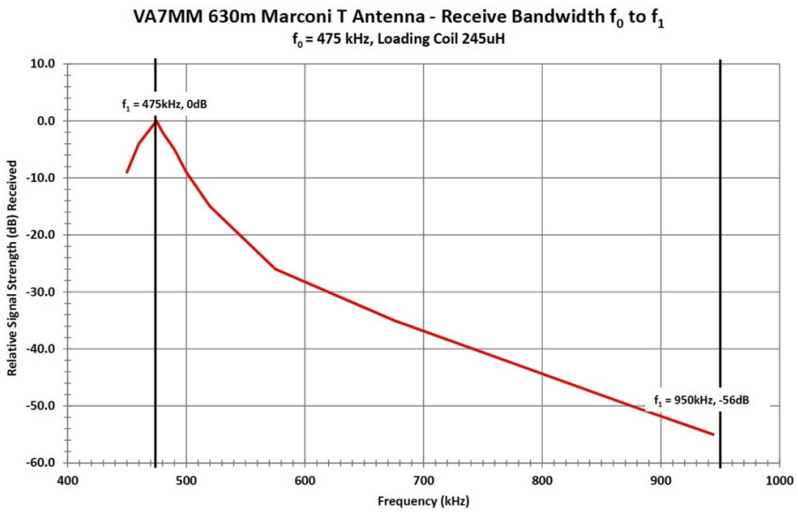


Figure 11: Second harmonic indicated at -56dB with 30m high Marconi T antenna.

It is important to note that if this amplifier is used on HF bands, higher order LPF designs would likely be needed to limit harmonic output to -43 dB below the fundamental frequency level. Elliptical LPFs designed and made available by WA2EUJ are recommended for amplifier use on HF bands.

Packaging

The packaging and mechanical design by VA7MM utilized a legacy external HDD case enabling a compact assembly. The heat sink projects out of the top of the case which had a rectangular area cut out of the top to enable fit and closure of the case, **Figures 12 and 13.** The low pass filters are external to the amplifier and packaged in Hammond aluminum enclosures, **Figure 12.**

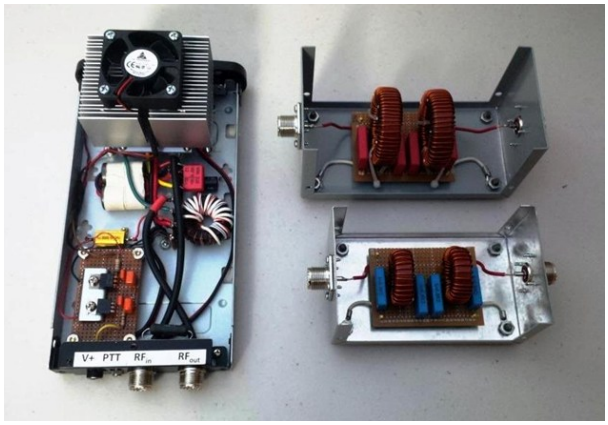


Figure 12: Amplifier and external low pass filters open for inspection.

Figure 13: Completed amplifier with fused DC power cable.

The N-channel MRF-101A MOSFET transistor is constructed with the exposed backside of the TO-220 package also serving as a source terminal for the transistor. Thus the mounting tab is at ground potential enabling grounded heat sinking and avoiding the need for insulation against the heat sink.

Conclusions

The function of a single MRF-101A MOSFET in a broadband 100W RF power amplifier application has been demonstrated for a frequency range of 136 kHz to 10.15 MHz. Nominal performance specifications for the amplifier are:

- Drive power: 1 W = 30 dBm
- Output Power: 100W = 50 dBm
- DC Power: 50V @ 3.5 A max.
- Gain Linearity: Input/Output power shows very good linearity to 55W RF output level and 1dB gain compression being reached at about 80W.

The Pi network LPFs for 137 and 479 kHz provide about 24 and 30dB of second harmonic suppression respectively. High Q antenna systems used for LF and MF bands when coupled with these filters provide additional suppression. In the case of the Marconi T antenna at VA7MM tested at 475kHz (antenna Q = 25), the combined suppression was found to be 86dB at the second harmonic. This amplifier if used in the HF range will likely require low pass filters that provide higher suppression of the second harmonic than do our LF and MF filters.

The authors found this a satisfying and easy to implement project and would like to acknowledge Jim Veatch, WA2EUJ, for the original HF amplifier concept and design and for his encouragement of our modification.

~ Mark VA7MM & Roger VE7VV
va7mm@telus.net and ve7vv@shaw.ca

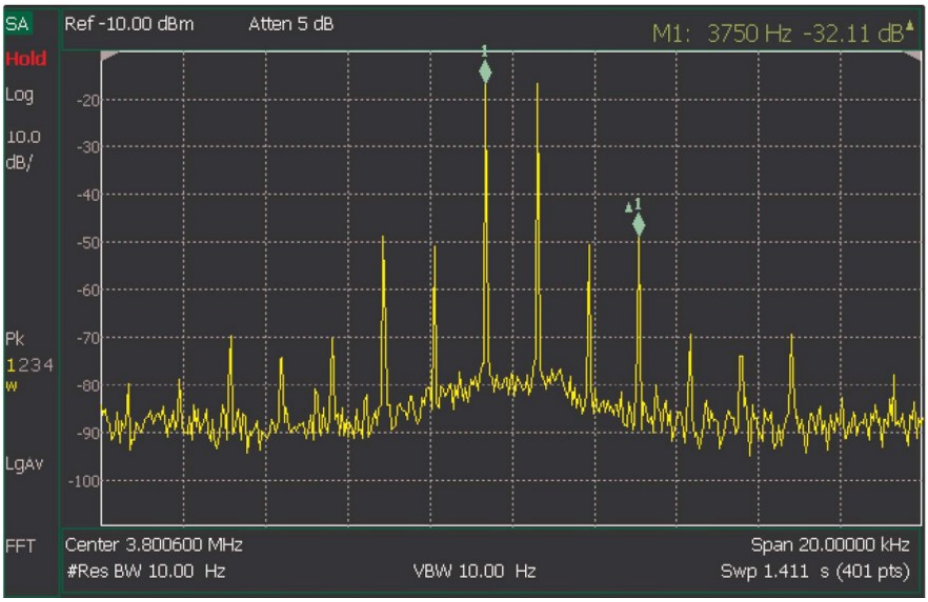
Appendix 3

WA2EUJ Amplifier Test Data

MRF-101 EVB Linearity Data

Two-tone test data, tones spaced 1200Hz, 60dB attenuation between EVB and spectrum analyzer. The topo of the screen is equivalent to +50 dBm (100W) at the output of the amplifier.

80m two 20W carriers 80W PEP:

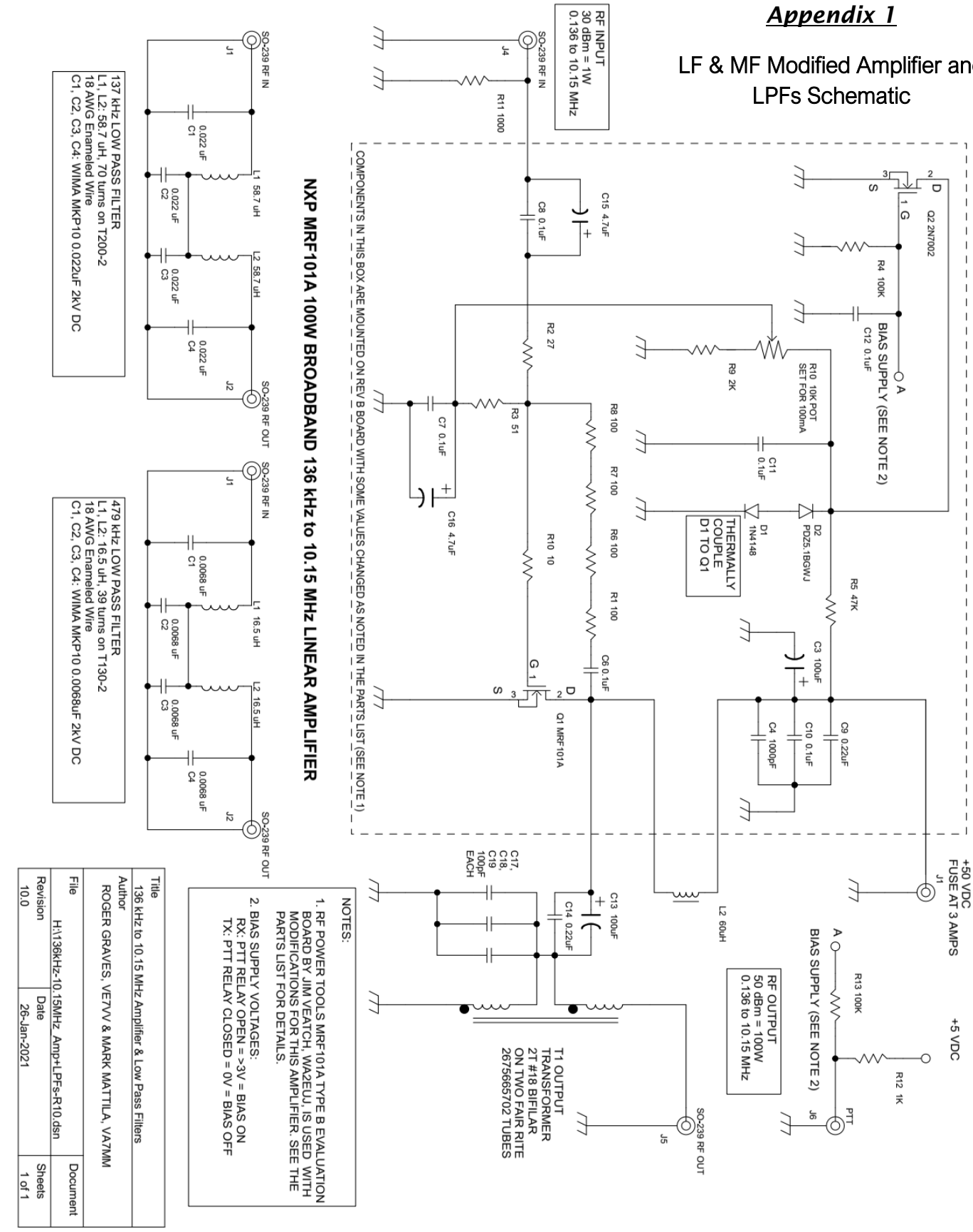


Worst case 5th order products 38 dB below PEP

Article appendices continue on the next pages

Appendix 1

LF & MF Modified Amplifier and LPFs Schematic



MRF-101A 100W BROADBAND 136 kHz to 10.15 MHz LINEAR AMPLIFIER
LIST OF MODIFICATIONS AND PARTS

ORIGINAL PARTS FOR MRF101A REV B EVALUATION BOARD:

ITEM	QTY	PART DESIGNATOR	DESCRIPTION	MFG	MFG_PN	REMARKS	DESIGN
1	1	BIAS= R10	TRIMMER 10K OHM 0.5W PC PIN TOP	BOURNS	3386P-1-103LF	USED AS SPECIFIED	WA2EUJ
2	0	C1, C5	CAP CER 0.1UF 100V X7R 0805	TDK	C2012X7R2A104K125AA	OMITTED, NOT USED	
3	0	C6, C7, C8	CAP CER 0.1UF 100V X7R 0805	TDK	C2012X7R2A104K125AA	REPLACED, SEE C6, C7, C8 BELOW	
4	0	C9	CAP CER 0.1UF 100V X7R 0805	TDK	C2012X7R2A104K125AA	REPLACED, SEE C9 BELOW	
5	3	C10, C11, C12	CAP CER 0.1UF 100V X7R 0805	TDK	C2012X7R2A104K125AA	USED AS SPECIFIED	WA2EUJ
6	0	C2	CAP 220PF 100V C0G/NPO 0805	YAGEO	CC0805JRNPO0BN221	OMITTED, NOT USED	
7	0	C3	CAP ALUM 330UF 20% 63V RADIAL	NICHICON	UVR1J331MPD	REPLACED, SEE C3 BELOW	
8	1	C4	CAP 1000PF 100V C0G/NP0 080	MURATA	GRM2165C2A102JA01D	USED AS SPECIFIED	WA2EUJ
9	1	D1	DIODE GEN PURP 100V 150MA SOD123	MCC	1N4148W-TP	USED AS SPECIFIED	WA2EUJ
10	1	D2	DIODE ZENER 5.1V 365MW SOD123	NEXPERIA	PDZ5.1BGWJ	USED AS SPECIFIED	WA2EUJ
11	0	J1	TERM BLK 2POS SIDE ENTRY 5MM PCB	PHOENIX	1935161	OMITTED, DIRECT CONNECTION TO BOARD	
12	0	L1	FIXED IND 47NH 500MA 310 MOHM	ABRACON	AISC-0805-R047J-T	REPLACED, SEE R11 BELOW	
13	1	Q1	RF TRANSISTOR 100W TO-220	NXP	MRF101AN	USED AS SPECIFIED	WA2EUJ
14	1	Q2	MOSFET N-CH 60V 0.17A SOT23-3	DIODES INC	2N7002H-7	USED AS SPECIFIED	WA2EUJ
15	4	R1, R6, R7, R8	RES 100 OHM 1% 2W 2512	BOURNS	CRM2512AFX-1000ELF	USED AS SPECIFIED	WA2EUJ
16	1	R2	RES 27 OHM 1% 1W 2512	VISHAY	CRCW251227R0FKEG	USED AS SPECIFIED	WA2EUJ
17	1	R3	RES 51 OHM 1% 1W 2512	VISHAY	CRCW251251R0FKEG	USED AS SPECIFIED	WA2EUJ
18	1	R4	RES SMD 100K OHM 1% 1/8W 0805	YAGEO	RC0805FR-07100KL	USED AS SPECIFIED	WA2EUJ
19	1	R5	RES 47K OHM 1% 1/8W 0805	YAGEO	RC0805FR-0747KL	USED AS SPECIFIED	WA2EUJ
20	1	R9	RES 2K OHM 1% 1/8W 0805	YAGEO	RC0805FR-072KL	USED AS SPECIFIED	WA2EUJ
21	0	RF_IN= J2, RF_OUT= J3	TERM BLOCK PCB 2POS 3.5MM GREEN	PHOENIX	1984617	OMITTED, DIRECT CONNECTION TO BOARD	
22	0	T1	INDUCT ARRAY 2 COIL 3.3UH SMD	WURTH	744851330	REPLACED, SEE T1 BELOW	

NEW OR REPLACED PARTS FOR MODIFIED AMPLIFIER:

ITEM	QTY	PART DESIGNATOR	DESCRIPTION	MFG	MFG_PN	REMARKS	DESIGN
1	3	C6, C7, C8	CAP C0G/NP0 SMT TYPE 0.1 uF	MURATA	GRM31C5C2A104JA01L	REPLACEMENT FOR MODIFICATION	VE7VV
2	1	C9	CAP FILM TYPE 100V 0.22 uF	WIMA	MKP1D032204D00JB00	REPLACEMENT FOR MODIFICATION	VE7VV
3	2	C3	CAP 100 uF 100V PANASONIC LOW ESR	PANASONIC	EEU-FR2A101B	REPLACEMENT FOR MODIFICATION	VE7VV
4	1	R10	RES 10 OHM 1% 1/4 W			NEW FOR MODIFICATION, HIGH FREQUENCY OSCILLATION STOPPER RESISTOR	VE7VV
5	1	C13	CAP 100 uF 100V PANASONIC LOW ESR	PANASONIC	EEU-FR2A101B	NEW FOR MODIFICATION, DC BLOCK	VE7VV
6	1	C14	CAP FILM TYPE 100V 0.22 uF	WIMA	MKP1D032204D00JB00	NEW FOR MODIFICATION, DC BLOCK	VE7VV
7	2	C15, C16	CAP 4.7 uF 100V PANASONIC LOW ESR	PANASONIC	EEU-FR1H4R7	NEW FOR MODIFICATION	VE7VV
8	3	C17, C18, C19	CAP 100 pF POLYPROPYLENE	WIMA	FKP2J001001D00KSSD	NEW FOR MODIFICATION, TRANSFORMER COMPENSATION CAPACITORS	VE7VV
9	2	T1	2T #18 BIFILAR ON TWO FAIR RITE 26775 665702 CABLE CORES	FAIR-RITE		NEW FOR MODIFICATION, CUSTOM BUILD OUTPUT TRANSFORMER	VE7VV
10	1	L2	60 uH RFC 74T #18 on T130-2 TOROID			NEW FOR MODIFICATION, CUSTOM BUILD RF CHOKE ACCOMPANYING DC BLOCK	VE7VV
11	1	R11	RES 1K OHM 1% 2 W			NEW FOR MODIFICATION, TO ENSURE DC GROUND POTENTIAL FOR C15	VE7VV
12	1	R12	RES 1K OHM 1% 1/4 W			NEW FOR MODIFICATION, ENABLE USE OF TRANSCEIVER SEND RELAY	VA7MM
13	1	R13	RES 100K OHM 1% 1/4 W			NEW FOR MODIFICATION, ENABLE USE OF TRANSCEIVER SEND RELAY	VA7MM

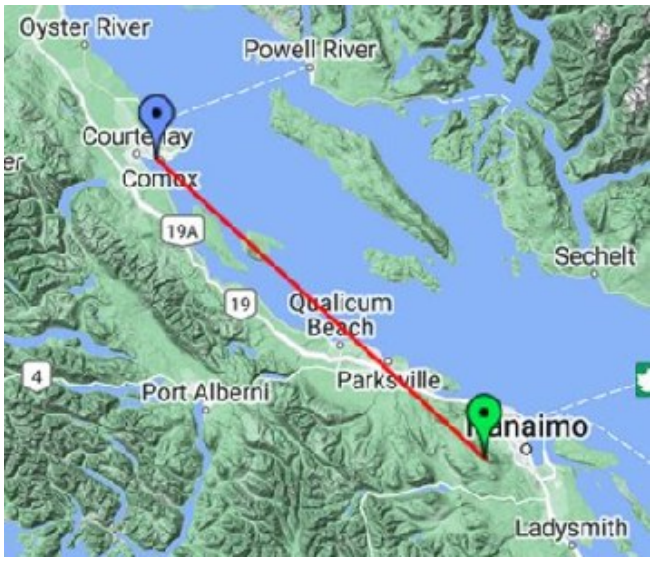
AREDN™
AMATEUR RADIO EMERGENCY DATA NETWORK

Ham Radio Mesh Networking

From Comox on Vancouver Island

By DEREK HUTCHINSON VE7VPG

In February 2024 I moved to Comox, a small coastal town on Vancouver Island, and joined the local amateur radio club - Comox Valley Amateur Radio Club (CVARC). Through the Wednesday morning coffee meetings I have met and chatted with a number of the locals about radio activities.



That is where I heard about the Amateur Radio Emergency Data Network which goes by the acronym AREDN (Are-Den). It turns out that this is an effort to provide high speed data using amateur frequencies in the GHz range. This caught my interest as a way to learn about networking, microwave based radio and just how well does line of sight work for radio frequency propagation. There are couple of locals who are interested in AREDN and pointed me towards further information and other active groups. My thanks to Ted Robb VA7ITR and Nathaniel Senff VE7SNF. It turns out that both the Nanaimo and Port Alberni radio clubs have people who are actively interested in AREDN and have equipment operating at 5.8 GHz. There is a groups.io for sharing information as well as Zoom calls every few weeks.

My first attempt was the line of sight from Comox to VA7ITS on Mount Benson near Nanaimo

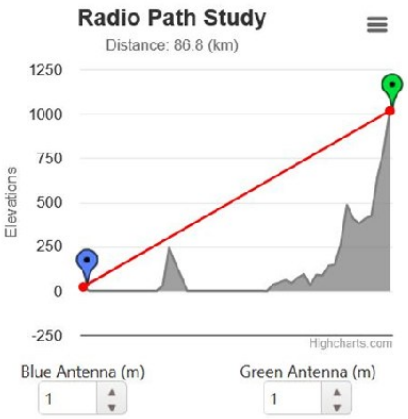
I learned that CVARC had done some testing of radio links to the south which had been successful; however, a site is needed that connects both to the south and to the local repeater on Mount Washington which is still under investigation. Getting a clear radio path in both directions is a bit of a challenge and as the saying goes "One tree is worth 30 kilometers". As I just have to make a single connection and have a view of Mount Arrowsmith, some 50 km to the south, it got me thinking did I have line of sight?

From one of the Meshtastic websites I found a RF light of sight calculator. See references for further information. I could readily get a latitude and longitude position for my house using my smart phone or Google Earth but finding positions for the AREDN sites I might be able to connect to was less straightforward.

The Nanaimo Amateur Radio Association (NARA) have a web page that directs you to an AREDN map which provides repeater names. No luck finding an accurate position in Repeater Book so my approach, while not optimal, was to use Google Earth to look for buildings and antennas at elevation. There was rough location information such as "Mount Benson" for VA7ITS but it took putting together a number of sources such as oblique photographs on radio club sites of work done on the repeaters, oblique photographs in Google Earth, asking people and the like to get a location I could use in the line of sight calculator. Of course being new to the region I did not have the benefit of having visited the repeater sites to know their location.

My suggestion is that you keep a text file with the repeater name, latitude and longitude once you do narrow down a position so you have it for future use and to help others.

My first attempt was the line of sight from Comox to VA7ITS on Mount Benson near Nanaimo. This is an AREDN site being setup by NARA. The result from the calculator looked as shown above right.

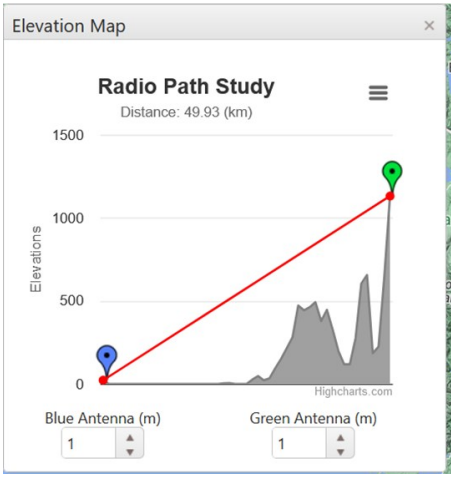


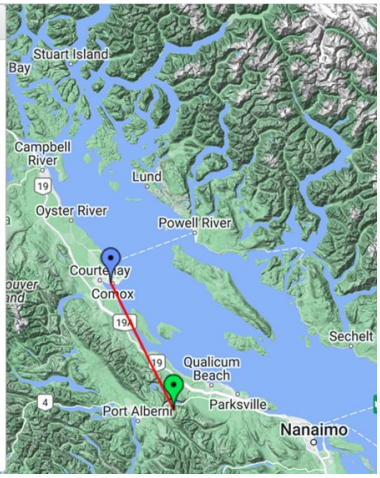
Line of sight from Comox to VA7ITS on Mount Benson near Nanaimo, The result from the calculator looked like this.

Not good news as the line of sight crosses Hornby Island which is covered in trees so I was not expecting that path to be viable. Next attempt was to try VE7KU which is on the height of land above Cameron Lake which is beside Highway 4, the road to Port Alberni. Rerunning the line of sight calculation produced a more promising result which looked as in the graphic below left.

Calculations are helpful but it does not take much to stop a microwave signal. Also, when I look towards VE7KU from my house in Comox I see what's in the photo below right.

VE7KU is somewhere between the tree and the chimney over my neighbour's roof perhaps a third of the distance from the top of the photograph. Looks promising but how do you really know if you have a working radio path?





The dish antenna/radio was light weight and, in my opinion, visually appealing, so very compact in its dimensions.

A test was in order and Chris Anton VE7TOP of NARA was kind enough to bring his AREDN equipment and drive up from Nanaimo to run a test at my location.

The test gear was compact: a 550 mm diameter 5.8 GHz dish antenna/radio, power supply, router and laptop. Chris had brought a Mikrotik "LGH XL 5 ac" antenna with built in radio as well as Mikrotik "hAP ac lite" router both flashed with the AREDN firmware. Here is a photograph of the antenna setup used for testing.

The dish antenna/radio was light weight and, in my opinion, visually appealing so very compact in its dimensions. The connection between the antenna and router was an ethernet cable which also supplies power to the radio using Power over Ethernet- no coax required! An easy to use web page interface to the AREDN radio set up page provided a "targeting tone" which provided audio feed to use when sighting the antenna at VE7KU. Channel 136 was selected with a 5 MHz channel width. In less than 10 minutes a 27 dB signal to noise ratio was measured for the RF path to the AREDN radio at VE7KU some 50 km away. The test confirmed the line of sight calculations and was a success. Chris had other antennas in his collection so a smaller diameter dish was also tested with a 23 dB SNR resulting. A smaller antenna maybe more acceptable to those non-HAMs that don't like looking at antennas. For me having another 4 dB is much preferred.

Time to buy some AREDN gear!

I have also learned that AREDN can be experimented with using a $40 AREDN compatible router (see the AREDN site for supported hardware) and a tunnel connection to an AREDN node over the internet.

So, an internet connection, the right hardware flashed with AREDN firmware and of course another HAM with an AREDN connection can get you going without having to have an RF link. This might be a low-risk path to try out AREDN.

~ Derek VE7VPG

References

Line of sight calculators:

https://www.scadacore.com/tools/rf-path/rf-line-of-sight/

https://ispdesign.ui.com/#

AREDN Web site:

https://www.arednmesh.org/

Mid Island AREDN Data Net:

http://www.ve7na.ca/aredn-local-mid-island/

AREDN map for the east coast of Vancouver Island:

http://usercontent.arednmesh.org/K/5/K5DLQ/livemap2.html#9/49.2875/-123.8626

A recent Saturday Denny's group. Come join us!

The Decline and Nostalgia of Shortwave Radio Listening

based on an article by AL WILLIAMS [HACKADAY]

Between World War II and the turn of the millennium, shortwave radio provided a unique educational experience. With a simple receiver, listeners could access a world of information, entertainment, and propaganda. This exposure often resulted in kids excelling in geography and gaining a broader perspective on global news and cultures. Receiving a QSL card from a distant land was a thrilling experience for many enthusiasts.

Today, the shortwave landscape has significantly diminished. According to Wikipedia, only 235 of the 414 shortwave broadcasters remain active, with nearly half now defunct. Many existing stations do not target a global audience or cater to niche groups of listeners.

The advent of the Internet has largely supplanted the need for traditional radio. Many broadcasters now offer streaming services or a combination of radio and streaming. For instance, the BBC is accessible 24 hours a day in crystal clarity via computers and smartphones, making traditional radio seem redundant.

In the past, a teenager in 1975 might have spent hours hunched over a shortwave radio, straining to hear broadcasts from NHK World Radio. Today, they are more likely to be engaged with content on popular social media platforms. While platforms like YouTube and Instagram provide global content, they also contribute to information overload. Shortwave radio offered a limited number of options, focusing listeners' attention on stations from countries like Germany, South Africa, China, Russia, Canada, and Mexico. This fostered a unique learning experience, as listeners became familiar with foreign capitals and languages.

A future Hackaday author in front of an Eico shortwave radio

The future of shortwave radio seems bleak. It is unlikely to make a significant comeback unless driven by a major event. While it is possible to listen to the BBC or other stations online, it lacks the appeal to draw in new listeners who are not already interested in radio. Even if there were a website showcasing global radio stations, akin to a digital version of RadioGarden, it would likely not attract a significant audience.

For those who do listen to shortwave radio, the question remains: what are you listening to? Do you engage with "world services" at all? Many careers were sparked by the discovery of a shortwave radio during childhood. When Internet access is compromised, there is still no substitute for real radios. Interestingly, vintage programs can now be found on the Internet, preserving the nostalgic charm of shortwave listening.

In the end, shortwave radio holds a nostalgic place in history, offering lessons and experiences that the modern Internet cannot replicate. However, its relevance in today's digital age continues to wane, leaving it as a cherished memory for those who grew up tuning into the world through its frequencies.

~ For Al's full article visit HACKADAY at: Ask Hackaday: Is Shortwave On Life Support? | Hackaday

I bought a transcription machine foot pedal to use its connector to hook my Kenwood TS-520 up to a TV-502 transverter. After scavenging the connector, I contemplated what remained. The foot pedal has 3 switches in it to help the transcriber play, stop, go forward, and go backward on the tape easily. It's gotta be usable for something!

So, I changed the wiring a bit and put a stereo 1/4" phone connector on the cord. See photo. Step on the left side for dits, right side for dahs. The middle button gives alternating dits and dahs. Operation is easier with both feet, but it's theoretically possible with just the left foot.

Anyone wanna give it a try?

~ Halden VE7UTS

Recent Astronomical and Terrestrial Events

Recently Dan wrote in HACKADAY that Sun watchers had a mix of excitement and disappointment in the last week of July as our Sun unleashed a colossal solar flare on July 23. This flare, classified as X14, was significantly more powerful than the X8.9 class flare in May, which produced spectacular auroras at unusually low latitudes. To put this into perspective, the X-class flares exceed 10-4 W/m^2 of soft X-rays, and the numbers within the class indicate a linear increase in power. Therefore, an X2 flare is twice as powerful as an X1, making the recent X14 flare about five times stronger than May's flare.

Although impressive, this X14 flare pales compared to the strongest flare ever recorded, an X45 event in 2003. Fortunately, the July 23 flare occurred on the far side of the Sun, sending its plasma harmlessly into space. This spared Earth from potential damage but also deprived aurora enthusiasts of a dazzling light show. The sunspot region responsible for the flare is currently moving across the Sun's far side, and it may retain its potential for further activity.

While solar flares pose a natural threat to our technology, recent events in France highlight human-induced vulnerabilities. On the nights of July 28 and 29, saboteurs targeted fibre optic cables in multiple locations, using tools like axes or angle grinders to cut through them. Despite their efforts, the saboteurs failed to cause a widespread outage or disrupt the Paris Olympics. Their actions suggest a probing attack rather than a full-scale assault.

In related communication news, Dan also passed on that the US Federal Communications Commission (FCC) recently took a General Mobile Radio Service (GMRS) system offline for violating regulations. The system linked repeaters, which is prohibited under 47 CFR §95.1733. The regulation forbids messages conveyed by wireline control links and transmitted by a GMRS station. Some GMRS operators mistakenly believed that linking repeaters through the Internet was permissible, as they interpreted "wireline" to mean landline telephones only.

Meanwhile, NASA is set to shut down its cable channel in a couple of weeks. Many people, including those who have cut the cord, were unaware of NASA TV's existence. For those who enjoyed its content, NASA's programming will still be available on the NASA+ streaming service. This transition marks another step in the shift from traditional cable to online streaming platforms.

Finally, for those seeking an engaging distraction during the summer, the React Flight Tracker offers a fascinating 3D visualization of global aviation. This open-source tool tracks all flying objects, from civil and military aircraft to satellites and space debris. Its Google Earth-like interface provides a unique perspective, such as illustrating the near-polar route from Istanbul to Seattle or the paths of flights from Tokyo to Frankfurt avoiding Russian airspace. React Flight Tracker is an entertaining and educational way to explore the complexities of global flight patterns.

These recent events, from solar flares to terrestrial sabotage, remind us of our interconnected world and the delicate balance between natural phenomena and human activities. Whether observing the cosmos or safeguarding our communication networks, vigilance and innovation remain crucial in navigating these challenges.

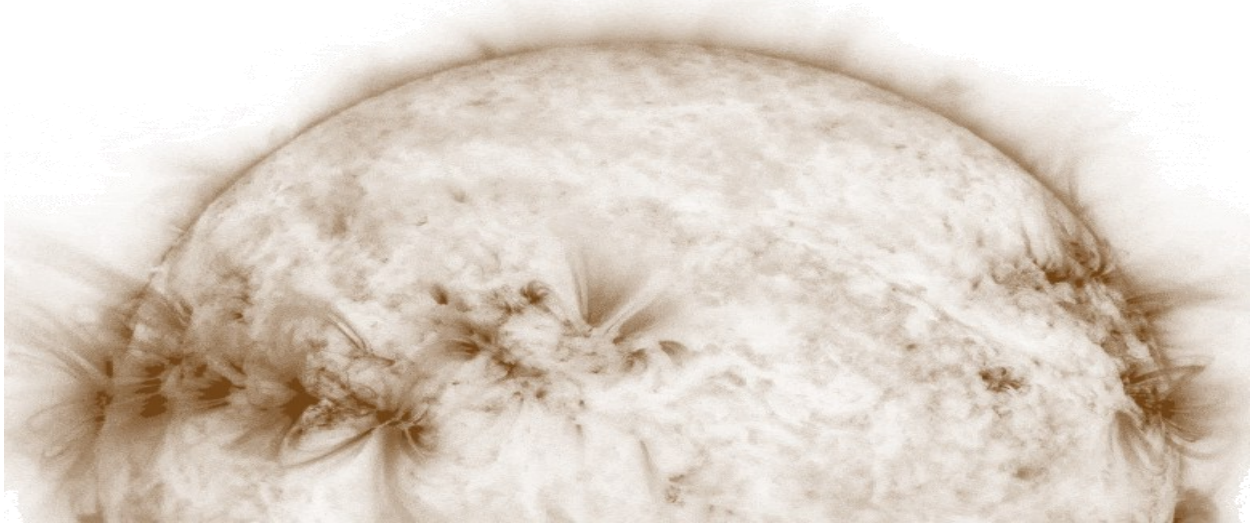
~ Read Dan's original article at HACKADAY

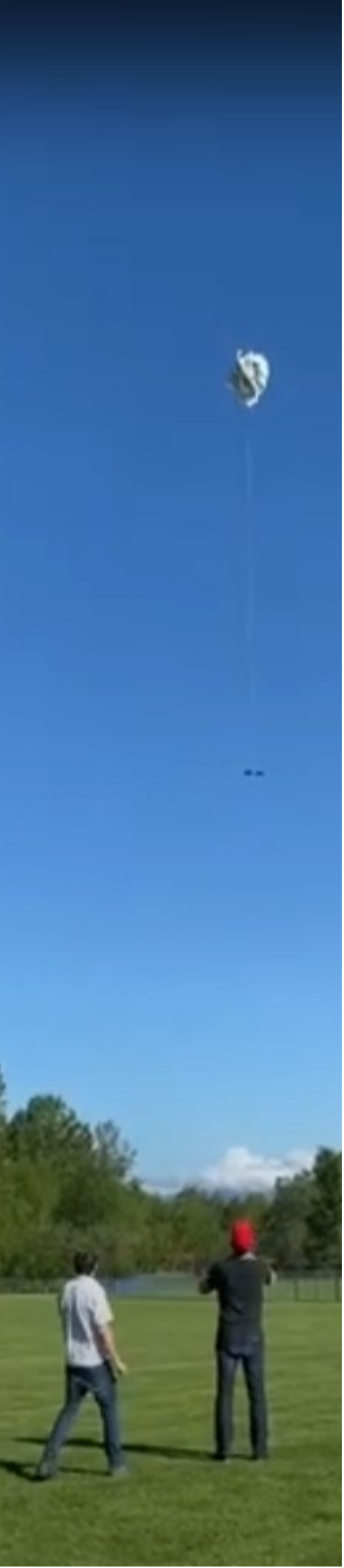
The Classification of X-ray Solar Flares

A solar flare is an explosion on the Sun that happens when energy stored in twisted magnetic fields (usually above sunspots) is suddenly released. Flares produce a burst of radiation across the electromagnetic spectrum, from radio waves to x-rays and gamma-rays. [more information] Scientists classify solar flares according to their x-ray brightness in the wavelength range 1 to 8 Angstroms. There are 3 categories: X-class flares are big; they are major events that can trigger planet-wide radio blackouts and long-lasting radiation storms. M-class flares are medium-sized; they can cause brief radio blackouts that affect Earth's polar regions. Minor radiation storms sometimes follow an M-class flare. Compared to X- and M-class events, C-class flares are small with few noticeable consequences here on Earth.

Classification	Associated SXR class	Description[17]
R1	M1	Minor radio blackout
R2	M5	Moderate radio blackout
R3	X1	Strong radio blackout
R4	X10	Severe radio blackout
R5	X20	Extreme radio blackout

~ A Guide to Solar Flares: What Does It Take To Be X-Class? (scitechdaily.com)





A Successful Balloon Launch

‘Icarus’ launched from Kwantlen Park

by SCOTT LEAF VE7SL

On July 23rd Scott (VA7SL) and I gave a presentation on pico and high-altitude ballooning to School District 36’s RF Communications Summer School. The class has 23 current and future ham radio operators aged 14-18 who are learning about radio communications throughout the month of July. The course is being taught by school teacher Adam VE7ZAL and SARC Course Coordinator and instructor John VE7TI.

We concluded with a successful launch of a pico balloon, callsign VE7NFR, at 12:33pm PDT (1933 UTC) from the school field. The balloon was a 32” Orbs that was stretched with an aquarium air pump to 33” prior to being deflated and then filled with enough hydrogen to provide 5.5 grams of free lift. The payload weighed 15.0 grams, so total lift was 20.5 grams.

The tracker was a U4B WSPR transmitter sending GPS coordinates (6 digit grid square), voltage, and temperature every ten minutes on 20m using a halfway dipole (magnet wire) and just 27 milliwatts. WSPR is amazing - even while the antenna was laid out on the grass we were being picked up in California.

The main change in this flight is that we are using a balloon with no silver coating - it is clear polyethylene which will hopefully better manage the conductive and radiative aspects of the cold surroundings but also the heat from the Sun at 12,000 m above sea level.

Our goal remains a full circumnavigation of the Earth. As of this time, ~20 hours after launch we are just crossing from NE Alberta into the Northwest Territories and are “floating” in the jet stream comfortably at 12,620 m ASL. This is exactly what we wanted so it is looking good!

Being solar powered it only transmits when in daylight, but when it is you can follow it at this link: https://bit.ly/4cWwF2M (note if you click on the gears in the top right you can change things like the speed display to km/h).

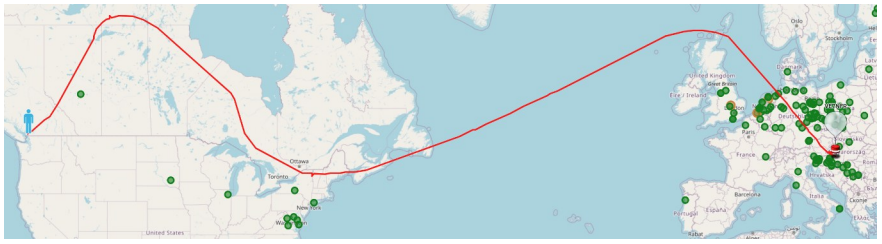
You can see a video of the launch at https://youtu.be/eQYVw6qFiV8

~ 73 from ground control Scott VA7SL

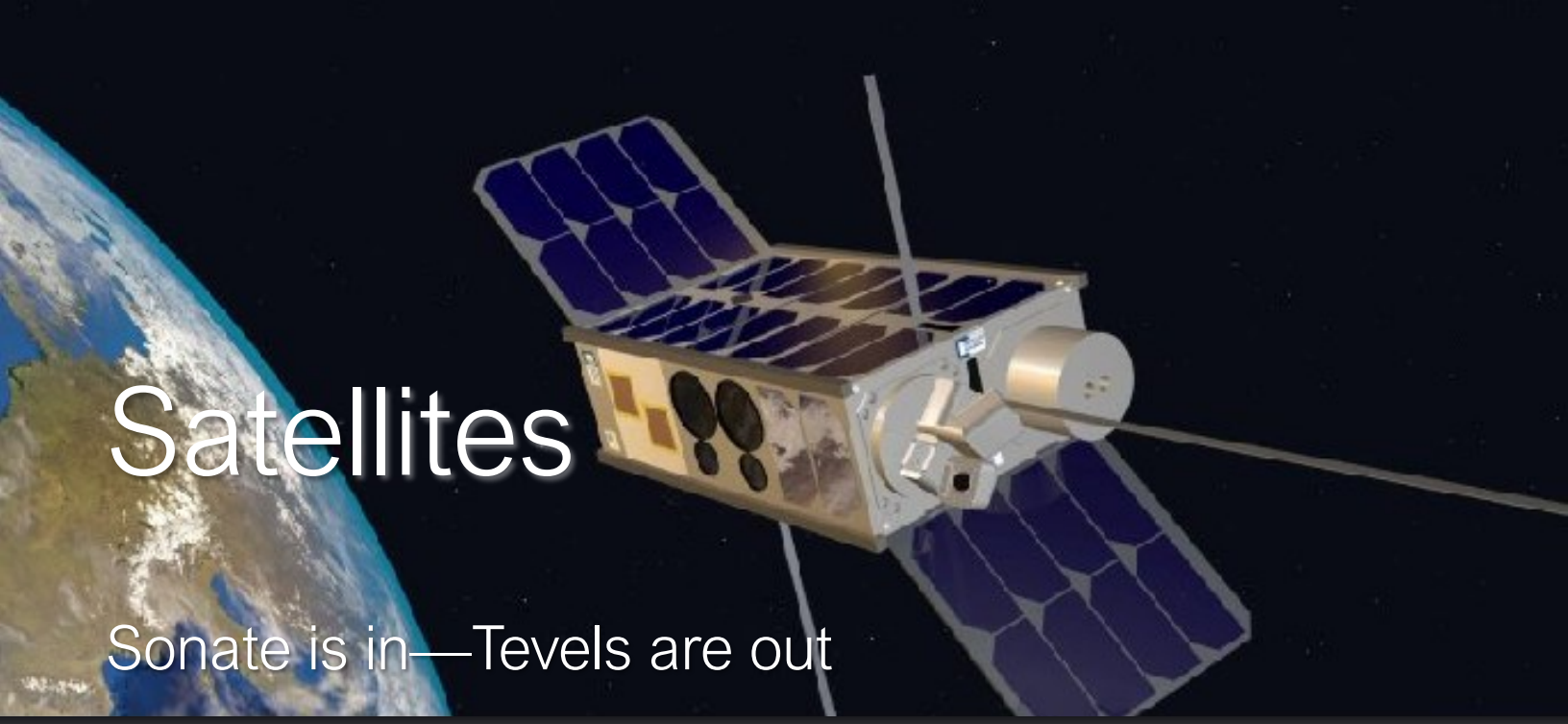
Scott and Adrian give their high altitude amateur radio ballooning presentation to the RF Communications high school class.

Pre-launch Scott VE7SL [right - light shirt] in charge of weather predictions and gas supervision, and Adrian VE7NZ [left - dark shirt] in charge of soldering and testing. VE7SLZ [not shown] performs software magic that makes it show up on the link above.

[Below] 'Icarus' as it had been named, was lost over the Black Sea in Europe around July 30th, dashing hopes of circumnavigating the globe.



An earlier July 7th launch



Satellites

Sonate is in—Tevels are out

by JOHN SCHOUTEN VE7TI

Two new satellites carrying several amateur radio focused payloads are now in orbit.

SONATE-2 originates from Julius-Maximilians-Universität in Germany and features an APRS digipeater. The satellite also features a VHF transceiver with SSTV downlink sending images captured by onboard cameras. This nanosatellite was developed by JMU Würzburg under engineer Professor Hakan Kayal. JMU has been developing small satellite missions for around 20 years. SONATE-2 now marks another high point.

The satellite will test novel artificial intelligence (AI) hardware and software technologies in near-Earth space. The goal is to use it to automatically detect anomalies on planets or asteroids in the future. The Federal Ministry of Economic Affairs is funding the project with 2.6 million euros.

SSTV downlink

Regular downlink of images captured by the on-board cameras
Frequency: 145.880 MHz
Modulation: Martin M1 SSTV FM (F3F)
TX Power: 500mW

APRS digipeater

APRS digipeater in half-duplex operation. Digipeater is only active when published at https://x.com/JMUSpace. When activated, it will transmit a greeting message every 2 minutes

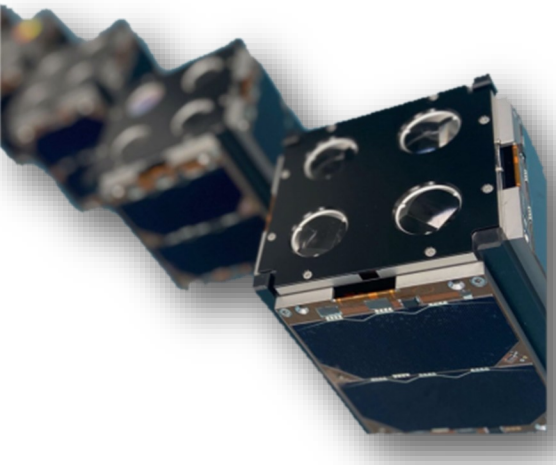
Make sure to include the SONATE-2 callsign DPØSNX in the APRS route.
Frequency: 145.825 MHz Up/Down
Modulation: 1k2 AFSK (F2D)
Protocol: AX.25
TX Power: 500mW

For details, see https://daily.hamweekly.com/2024/08/new-amateur-satellite-payloads-in-orbit

ROBUSTA-3A, a 3U CubeSat built by students at Université de Montpellier in southern France, carries a 9k6 GMSK AX.25 store-and-forward digital system.

The UHF transmitter features a powerful 3 watt downlink. Short telemetry bursts can be heard on its downlink frequency of 436.750 MHz prior to full activation.

~*AMSAT*



TEVEL satellites have begun atmospheric re-entry and decommissioning

The TEVEL satellite project, featuring a series of 8 CubeSats designed and built by Israeli students, has entered its final phase with the atmospheric re-entry and decommissioning. This initiative, a collaboration between the Israel Space Agency (ISA) and Tel Aviv University, has been a key educational tool, providing practical experience in satellite technology to students across Israel.

Launched in January 2022 on the SpaceX Falcon 9 Transporter-3 mission, the TEVEL satellites were part of a broader effort to promote STEM education. The CubeSats, built to the 10x10x10 cm standard, were used for various missions including scientific data collection, amateur radio communication, and technology experimentation. The project aimed to enhance students' understanding of satellite technology and prepare them for careers in the space industry.

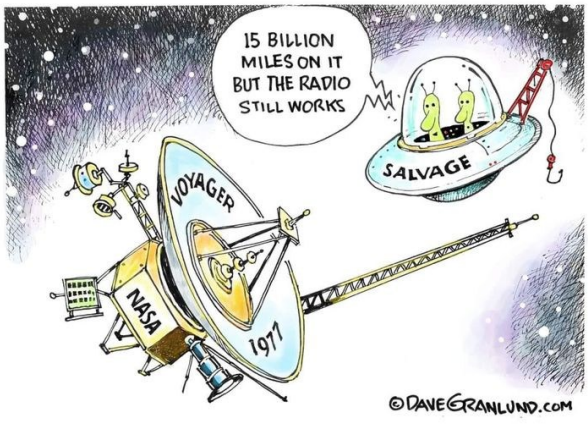
Equipped with radio transponders, they allowed amateur radio operators worldwide to communicate via satellite, fostering international collaboration and technological experimentation. This feature provided a unique platform for enthusiasts to engage in satellite communication.

All eight TEVEL CubeSats are expected to decay from orbit in the next few weeks, and as the satellites have now started to re-enter Earth's atmosphere, it marks the end of their operational lives. The re-entry process, with satellites burning up upon re-entry is being monitored by both educational teams and the broader space community. This final stage offers a valuable learning opportunity for students tracking the satellites' descent and analyzing the data.

Looking ahead, David Greenberg, 4X1DG, has announced a new TEVEL mission featuring nine additional satellites, continuing the educational and amateur radio goals of the original initiative.

The success of the TEVEL project sets a precedent for future educational satellite initiatives, demonstrating how hands-on learning can be integrated with practical space missions. As the satellites complete their final descent, they leave behind a legacy of inspiration and international collaboration in both educational and amateur radio fields.

[ANS thanks Lorenzo Gianlorenzi, IU1BOT, Vashradio.org, for the above information]



No counterpoise…

How does the speaker wire work?

by JOHN CORBY VA3KOT

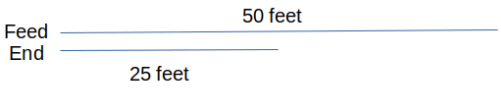
John Corby VA3KOT resides in Owen Sound, Ontario but is more often found operating CW out in the "Big Blue Sky Shack". He especially enjoys activating parks for the POTA program and blogging about his experiences at HamRadioOutsidetheBox.wordpress.com

Fellow blogger Craig WB3GCK recently posted an account of his build of the speaker wire "No Counterpoise Antenna" and I was immediately intrigued. In fact I rushed out to the store and bought myself a couple of 50ft rolls of 18AWG speaker wire to experiment.

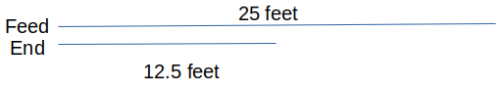
After a couple of days of intense backyard wire whispering I have concluded that the name "No Counterpoise Antenna" may be a misnomer. Some sources refer to it as the "no counterpoise on the ground antenna" which is probably more accurate.

What is a "No Counterpoise Antenna"?

The name is applied to a length of twinlead 25ft or 50ft long, with one conductor stripped away for half its length.

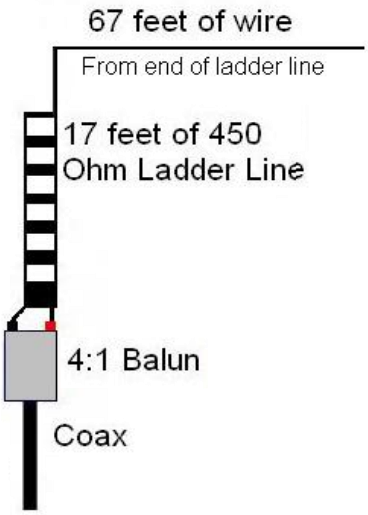


Does it Work?



To this question I can only give a qualified "yes". I connected the twinlead end of the the 50ft version of the antenna to the balanced line input of my "Super T" antenna tuner and was easily able to find a match on the three bands of interest for my QRP Labs QMX: 20m, 30m and 40m.

No Compromise Speaker Wire
Antenna 25ft or 50ft long



A typical Zepp antenna

What Kind of Antenna is it?

The No Counterpoise Antenna resembles a Zepp or a W3EDP. But it could also be a very strange interpretation of an Off-Center Fed Dipole. I read several sources online and none of them has come to a firm conclusion on that question.

Is it a Zepp Antenna?

The first question I asked myself was: "why 25 or 50ft?" The best answer may be: "because that's the way speaker wire is sold". Next question: "why strip one wire half way? Is twelve and a half, or twenty-five feet a significant length for the twinlead feedline?" Then I considered a third question: "is this antenna related to the Zepp?"

The original "Zepp" or Zeppelin antenna comprised a half-wavelength radiator fed through a quarter-wavelength transmission line. The transmission line acted as an impedance transformer to bring the very high impedance of an end-fed half wave wire down to something a transceiver could handle. So, if the "No Counterpoise Antenna" is a variation of the Zepp, then the twinlead part of the antenna would act as an impedance transformer.

Problem #1 with this theory is that this would make it a single band antenna whereas the speaker wire No Counterpoise Antenna is a multiband antenna.

Problem #2 Jose VA3PCJ has built and successfully used a full-sized W3EDP, a half-size W3EDP and even a quarter-size W3EDP. [A W3EDP is a modern interpretation of the Zepp in which a 17ft feedline feeds a 67ft radiator and tunes 160m to 6m]. The full-size version uses a 17ft feedline, the half-size uses an 8.5ft feedline and the quarter-size uses a 4.25ft feedline – and they all work.

Problem #3 Speaker wire is designed for audio frequencies; let's say from DC up to 30KHz. Can it handle Radio Frequencies? Is the dielectric effective at RF? Maybe for QRP but I wouldn't trust speaker wire as a feedline at or beyond 100 watts.

Is a Quarter Wave Speaker Wire Feedline an Impedance Transformer?

Speaker wire has a nominal characteristic impedance of around 100 ohms but that may not remain constant since it was never intended to be used for RF. I measured the velocity factor, with my RigExpert AA-55 Zoom antenna analyzer, to be 0.95 then trimmed a feedline to make it an electrical quarter wavelength at the bottom end of the 20m band. Then a halfwave wire was soldered to one of the conductors of the feedline, leaving the other conductor open.

A halfwave wire will have a very high impedance at its end – typically around 2500 ohms. If the radiating element is shortened to a random length, say 29ft, its end-point impedance should drop to around 200 ohms. So we can easily make some simple calculations to see if an impedance transformation is taking place by comparing a half-wave radiator with a random length radiator.

Lets do the math:

Parameters: Z_O=Transmission line characteristic impedance | Z_L=Load impedance (e.g. halfwave end-fed wire) | Z_{in}=50 ohms (desired impedance)

Formulas: $Z_{in}=Z_O\text{^}2/Z_L$ | $Z_O=(Z_{in} \times Z_L)\text{^}0.5$

Case #1: Match 2500 ohm EFHW to 50 ohms

$Z_O=(2500\times50)\text{^}0.5 = 353$ ohms

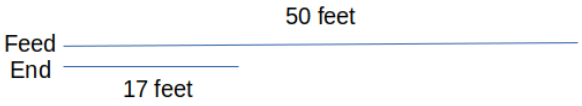
Case #2: Match 200 ohm EFRW to 50 ohms

Z_O=(200×50)^0.5 = 100 ohms

- In case #1 – matching an End-Fed Half Wave wire to 50 ohms requires a transmission line with characteristic impedance of approximately 350 ohms. Our speaker wire has an assumed characteristic impedance of just 100 ohms so we would expect a 3:1 mismatch.
- Case #1 *actual measurements*: SWR is 1.43 (after tuned for best SWR). Resonance is at 14009 KHz R=69 ohms, X=5.54 ohms
- In case #2 – matching an End-Fed Random Wire to 50 ohms requires a transmission line with characteristic impedance of 100 ohms. Our speaker wire has an assumed characteristic impedance of 100 ohms so we would expect a perfect match.
- Case #2 *actual measurements*: SWR is 1.34 (no further tuner adjustments). Resonance is at 14047 KHz, R=67 ohms, X=2.41 ohms

Clearly, the actual measurements do not conform to the calculated values so it is very unlikely that the twinlead feedline is acting as an impedance transformer.

So how does the antenna measure up on 20m, 30m and 40m?



VA3KOT's Speaker Wire Antenna

The radiating element was restored to 33ft while maintaining the twinlead portion at the same length (15 feet 8 inches). Each of the three bands of interest (20m, 30m, 40m) were then measured on my RigExpert AA-55 Zoom antenna analyzer with the following results:

- 20m (14065KHz): Resonance (i.e. X=0) = 14096 | SWR = 1.17 | R = 58 | X = -2.94
- 30m (10125KHz): Resonance (i.e. X=0) = 10132 | SWR = 1.12 | R = 44 | X = -0.13
- 40m (7060KHz): Resonance (i.e. X=0) = 7063 | SWR = 1.36 | R = 37.8 | X = -0.37
- * all R, X measurements in ohms

Conclusion

I was finally able to get a QSO completed on the speaker wire antenna, on 40m. The wire was erected as a low (about 20ft) lazy inverted-L. I responded to a POTA operator just south of Lake Ontario in upper New York State from my QTH on the shore of Lake Huron in Ontario. The distance between us was only about 250km which under present conditions was a little too close even for 40m. The other op was coming in at 599, but with significant QSB. He gave me a RST report of 229 (I was using my QMX radio at 5 watts CW). So I can give the speaker wire antenna a qualified thumbs up.

How does it work? My belief is that the short wire is in fact a counterpoise. If it were not for VA3PCJ's good results with using very short length's of feedline I would recommend using the original dimensions reported by Craig WB3GCK.

It's fun to experiment with oddball antennas and that is what ham radio is all about for me. If you have any opinions about this antenna let me know in the comments.

Finally, Ham Radio Outside the Box has attracted a lot of new followers recently. Thank you all for subscribing, I appreciate the support.

~ John VA3KOT

VE9KK the world of CW

Are you trying to pickup your CW speed?

…here is some info

by MIKE WEIR VE9KK

Mike Weir VE9KK was first licensed in 1989 and upgraded to advanced in 2000. He primarily operates contests both CW and RTTY.
His blog is at: [VE9KK the world of CW]

Giving it all you've got but you seem to be held at a CW speed between 10-13wpm… what's happening? First off there is nothing wrong and this is normal even better if you're ready to jump to the next step in learning CW. Here is the thing as you improve and your CW speed picks up the time it takes to recognize each letter speeds up as well. When you are in the the 10-13wpm bracket your time to acknowledge the letter collides with the next letter coming at you. This is what hampers you from getting to the next CW milestone.

So what to do… it's now time to move to the next level of CW and that is instant character recognition or ICR as it is called. Did you know most of you at this very point in time can have code sent to you at 38wpm and you can decode it!! WHAT you say… have I been drinking, most of you if I sent "CQ" at 38wpm you would know what I was sending. How about "73" again most of you would understand at 38wpm what I was sending to you. When both CQ and 73 were sent at that speed you knew it because you were practising ICR. At that speed, you were not hearing C and then Q

and putting it together but you knew the sound of CQ or 73. This is what ICR is all about. Knowing the sound of each letter (later you can dive into words and phrase sounds) It's important to not just skip to common CW QSO phrases and words, I say this because to instantly know the letters and number is important for copying call signs, QTH's and names.

How does one start up the ICR ladder of code, well it's very fast and easy and I mean fast. You need to speed things up so you're only able to hear a sound and not dots and dashes. Just like CQ at 38wpm, you hear the sound, not each letter or the dots and dashes that represent each letter. At first, your brain is going to wonder what you are up to as it is used to only working at 10-13wpm and the method used to convert dots and dashes to letters or numbers. Now it's a rhythm your brain is being exposed to.

I started by using a program where I could control the letters I wanted to know the rhythm of and start with easy ones to start tuning the grey matter. Look at a program such as MorseCode World that allows you to practice letters of your choice at the speed of your choice. At the website click on CW generator. Once there enter the letters/ numbers you want to learn. Now click on Morse controls button and set your speed. The letters I started with were E, T, C, I, K, M, and O. I entered each letter 8 times and then on the next line 8 of the next letter.

See below:

E E E E E E E E
T T T T T T T T
C C C C C C C

Set the speed at 18-20wpm and hear the rhythm of the letters and not dots and dashes. I enter about 3-5 letter groups and give it a go for a few days. Now don't write down what you hear but just go over it in your mind what letter it is. Then change it up by mixing these letters up and try again, don't look at the page of letters and don't write it down. Just listen to the sound and in your head say the letter.
Your brain will start to pick up the new challenge you are giving it and yes when you hit H,5, S or B and 6 your brain will reply "Say what" BUT your brain is very powerful and soon will pick up these letters and even when you send H, S B, 6, V and 4.

As with anything you learn, it is a journey and just remember to always enjoy it and never forget how far you have come along. Enjoy your next adventure of ICR.

~ Mike VE9KK

As ham radio operators no matter what mode you operate one major contributing factor regarding success or failure is the Sun. Propagation reports can be found on the internet, some with cool pictures and others with just lines of data. Things such as solar flares, coronal mass ejection (CME), solar wind and the list goes on. Being able to look at propagation data and interpret it is beneficial. An understanding can help us realize that not all solar flares, CME and high solar wind can mean poor conditions. I found a great site that goes through many areas that make up a propagation report. At some points yes it can get into too much detail but overall I found it to be very informative. Understanding propagation can be very interesting and also can help you understand the data that is shown. Here is the LINK to a site that gives great information about propagation.
Here are some propagation sites:
Solar Ham
Current ham radio conditions

Another neat accessory repurposed

This is the pistol grip stand tripod stand that a ham showed me at the Four Days In May QRP event . It was so small, versatile and folds up into your hand. I then went out the next day to Walmart and bought one for $6.

I didn't realize that it came with a adjustable phone holder which turned out to be a big bonus. The cell phone adjustable bracket fits the QCX rig perfect or for that matter any small radio. I then took the cell adapter off the stand so it could be used with my portable HF antenna. It works perfectly and is low to the ground, so very stable. I did find out that you can get these cheaper online on AliExpress.

If you have any day to day items adapted for Ham use, send me an email I'd like to hear about it!

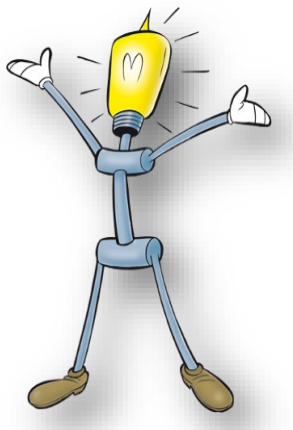
~ 73 Mike VE3MKX

Want to display your contacts?

If you have logged your contacts in a program that will output a .ADI file, then you can display them on a map using a great website from DL8WKF.

Go to phpQW Tool Log Analysis (adventureradio.de), fill in the blanks, and upload your .ADI log file. You will quickly get a colourful on-screen map of your contacts. You can zoom in for greater detail. To save it, just do a screen grab.

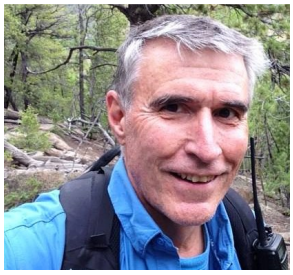
~



The talisman radio

Magical powers?

by BOB WITTE K0NR



Bob Witte K0NR maintains a great blog site at https://www.k0nr.com/wordpress/

Lately, I've encountered many people who apparently believe their radio is a Talisman. What is a Talisman, you say?

> *Talisman – An object marked with magical signs and believed to confer on its bearer supernatural powers or protection.*

These people purchase some kind of two-way radio and have it stored away in their desk or closet, believing that having it will confer communication powers during an emergency. (Not to pick on Baofeng owners, but these radios are almost always a Baofeng UV-5R.) In many cases, they have the radio programmed with a long list of radio frequencies that have been identified as being good to have during an emergency. These are usually a mix of amateur radio, Family Radio Service, General Mobile Radio Service, Multi-Use Radio Service, search and rescue, and local fire and police frequencies.

Usually, the owner of the Talisman Radio has no real idea of how these frequencies are used. Again, someone told them they are good frequencies to have in a SHTF scenario. They often don't know how to operate the radio or know what to expect in terms of its communication capabilities. It is simply a magical device that will save them when bad stuff happens.

Sometimes these people take the basic step of getting their amateur radio Technician license. I applaud this decision as it is the first step towards learning about ham radio. It also provides the proper license for legally using the radio on the ham bands. Unfortunately, many of these people just memorize the questions long enough to pass the exam and don't gain any useful knowledge. This is a fundamental error. A much better approach is to focus on acquiring skills, knowledge, and equipment as part of their emergency preparedness plans. (Serious preppers know and practice this.)

If you are the owner of a Talisman Radio, I urge you to build your skills and get your ham license (if you don't already have it.) There are many good license books available and the Ham Radio School online course is an excellent approach to learning this material. If you encounter Talisman Radio owners, please encourage them to get some training and learn how to use the radio. Don't offer to program their radio with a bunch of frequencies they are not licensed to use and that may cause considerable trouble in the frequency spectrum. Encourage and help them but don't enable their dependence on a Talisman Radio that will only let them down.

Training, training, training.

That's what I think. What's your opinion?

~ 73 Bob KØNR

TD-H3 VHF/UHF Radio

News Flash: I found a ~~cheap~~ economical VHF/UHF handheld that I really like. The TIDRADIO TD-H3 is getting a lot of attention from YouTube reviewers. You can think of this as an improved Baofeng UV-5R, with a few key features that grabbed my attention:

Improved Look and Feel: This radio looks like a quality product, much improved over the plastic Lego-style industrial design of the Baofeng radios. It feels and looks solid in my hand. The rubber duck antenna seems higher quality although I haven't tested its performance.

One Radio, Three Modes: The firmware can be set to operate in three distinct configurations: Ham (transmit on 2m and 70cm ham bands only), GMRS (standard FCC Part 95 GMRS channels) and Normal (which is basically unlocked). You can easily switch between these modes but the memory information does get reset. So in most cases, you will need to reprogram the radio with your favorite frequencies after you change modes. The exception might be GMRS mode which will reset to standard GMRS channels. The flexibility of these three configurations is quite nice: The **Ham** configuration is great for normal ham operating with no risk of going "out of band." I can loan out the radio in the **GMRS** configuration knowing that the user won't inadvertently transmit on the ham bands. And, of course, the **Normal** mode provides access to a wide range of frequencies, to be used carefully, abiding by the relevant regulations.

USB-C Connectors: The radio battery has a USB-C connector for charging and a USB-C connector for programming (with Chirp or the TIDRADIO app). This may seem minor, but using a common industry-standard connector is a huge convenience factor. For example, I recently packed my gear for a trip and found that the USB cables I normally carry for my smartphone and tablet will handle the TD-H3 just fine. So there is no need for a drop-in cradle, extra charger or special programming cable.

Video Reviews

Apparently, TIDRADIO gave away a gazzillion radios to ham radio Youtubers and asked them to review the radio, so you'll find many reviews out there. This one gives a good overview of the radio's capabilities:

This radio is not quite the One Radio To Rule Them All, primarily because it won't be convenient to switch between configurations. However, the radio is legal for GMRS and ham use, so that is definitely a plus. Will the FCC object to this kind of flexibility? Who knows, but they haven't so far.

This video from KS6DAY shows how to switch between the three radio configurations:

Some Problems

Early on, several Youtube reviewers reported high spurious emissions coming from the radio. They fed this information back to TIDRADIO, who responded with a design change and some updated radios to test. They appear to have corrected this problem…the three radios in my possession tested out fine. There have also been

some complaints about how a few features work and TIDRADIO has responded with a firmware upgrade to address those issues. So we can give TIDRADIO a good grade for responsiveness but poor marks for releasing a product that was not completely baked. Unfortunately, there are many videos in the etherwebz claiming the radio has problems and it is a challenge to sort through the actual situation today.

To become familiar with the radio, KS6DAY has a series of videos that explain how to use the radio. Lots of good information here:

Summary

As I mentioned, I have three of these radios and may be going back for more. For me, they fit the role of that "spare radio" that is kept in my vehicle, loaned out to other people, or just stored away for When All Else Fails.

~ 73 Bob KØNR

Check out Rob's book
VHF, Summits and More: Having Fun With Ham Radio.

KB6NU'S HAM RADIO

Interesting stuff from Mastodon:

Vacuum tubes, open source, and Linux

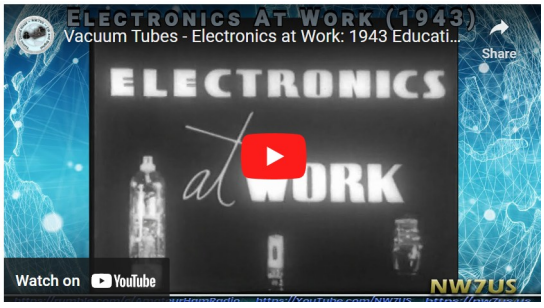
by DAN ROMANCHIK KB6NU

Dan Romanchik KB6NU blogs about amateur radio at KB6NU.com when he's not trying to figure out which way current flows. Dan teaches ham radio classes, and operates CW on the HF bands. Look for him on 30m, 40m, and 80m. You can email him at cwgeek@kb6nu.com

Here are three interesting things I found on mastodon last night. If you're a mastodon user, you can follow me at @kb6nu@mastodon.radio. If you primarily post about #hamradio, I'll follow you back.

Electronics at Work: 1943

In 1943, electronics was all about vacuum tubes. This video is a good introduction to how vacuum tubes work and how they were used in industry.



Open Source in Amateur Radio Wiki

The Open Source in Amateur Radio Wiki provides information about open-source software and hardware as well as free home-brew projects for radio enthusiasts and promote the use of open source software and

hardware in amateur radio. The wiki's founder, Michael, DK1MI, writes, "This wiki cannot be filled and maintained by one person alone, which is why I call on people to register on the wiki in order to correct errors, add information, translate articles and/or create new content." Check out the how to contribute page for more information.

Amateur Radio Community Operating System (arcOS)

arcOS is a bootable Linux system on a USB drive. arcOS is founded on the belief that digital communications within communities of operators can be accessible and easy to use for ALL, regardless of license class or experience.

The author of arcOS is KG4VDK. He writes, "By minimizing the number of included applications and complexity, arcOS strives to avoid overwhelming new or inexperienced users, while offering ambitious users the ability to configure additional features and functionality."

I haven't tried it yet, but it looks like something to investigate.

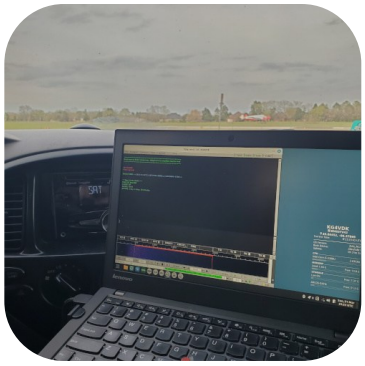
~ Dan KB6NU

What is arcOS?

The Amateur Radio Community Operating System is a bootable Linux system on a USB drive. arcOS is founded on the belief that digital communications within communities of operators can be accessible and easy to use for ALL, regardless of license class or experience.

Simple.

arcOS focuses on standarized digital communication modes commonly used for both casual and emergency communications. By minimizing the number of included applications and complexity, arcOS strives to avoid overwhelming new or inexperienced users, while offering ambitious users the ability to configure additional features and functionality.

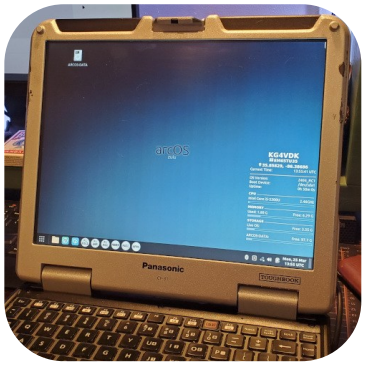


Portable.

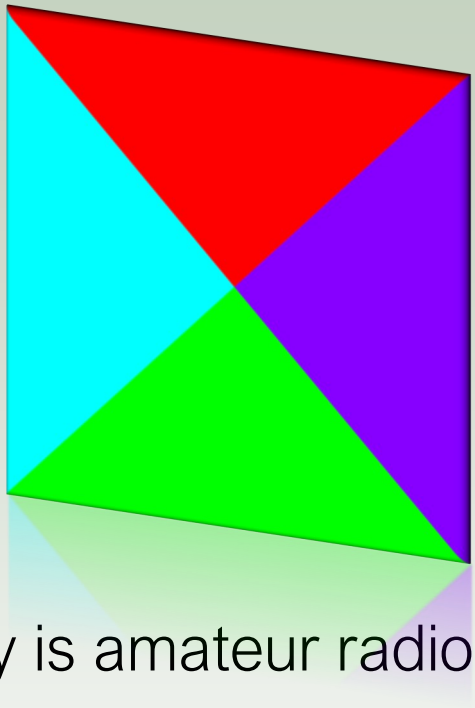
arcOS runs on almost any modern-ish x86_64 computer. This means the arcOS USB can be used just about anywhere. By using modular scripts, users can configure arcOS to be deployed for many different roles. Communities of operators can collaborate to build modules suited for their needs. Operators can even share these modules over the air to help others in real time.

Reliable.

After booting from the USB, arcOS "just works!" Basic digital communications are ready to go, right now. With arcOS, users are not responsible for maintaining an installed Linux system. Feel free to explore and experiment, knowing that any mistakes are easily undone by rebooting.



Foundations of Amateur Radio



What kind of hobby is amateur radio?

by ONNO BENSCHOP VK6FLAB

Onno Benschop
VK6FLAB
To listen to the podcast, visit the website: http://podcasts.vk6flab.com/. You can also use your podcast tool of choice and search for my callsign, VK6FLAB.

Full instructions on how to listen are here: https://podcasts.vk6flab.com/about/help

Having been a licensed member of this community since 2010 I feel qualified to answer a recurring question: "What kind of hobby is amateur radio?"

The single best answer I can give is that it's big. The deeper you become involved, the bigger it gets. I stole the phrase, "amateur radio is 1000 hobbies in one" and I've remarked that I suspect that it's underselling the experience. Point being, whatever you've heard about amateur radio is likely true and guaranteed to be only part of the story.

There was a time when amateur radio was a concept regularly seen in general discussion. That's no longer the case, but you'll soon discover that amateurs are everywhere and the things we get up to still make the headlines from time to time.

That said, as a community we tend to use complex language and in specific ways. For example, a radio amateur is unlikely to broadcast, instead they transmit. From the outside looking in the two are synonymous, but within amateur radio the two couldn't be more different. Broadcasting is one to many, transmitting is one to one. Broadcasting separates the operator from the equipment,

transmitting has the operator actively engaged with it.

Amateur radio is about curiosity, about trying things, about learning and sharing, it's about technology, electronics, nature and physics, it's about software and hardware, about camping and competing and plenty more and with that come friendships that seem to last a lifetime, perhaps forged in the fire of fascination, perhaps made almost perchance in passing. I have more amateur friends than not and among us we have a massive variety of interests.

Unlike most hobbies, you need to obtain a government issued license to become a fully licensed amateur, as-in, be permitted to transmit. For some this requirement might be a deterrent, but once you understand why, since radio waves don't stop at political boundaries and every human shares the same radio spectrum, licensing becomes a necessity, not an obstacle. That said, you can start long before then by receiving, no license required.

Amateur radio is a global activity. It's centrally regulated, but administered locally in each country and locality. As a result I cannot tell you specifically how much things will cost where you are, but the fees are generally not cost prohibitive and in many cases they are low or even free.

You become licensed by completing a training course, passing an exam and receiving a certification that lasts for life. Once you are certified you can apply for a callsign and operate an amateur station. The closest equivalent to a callsign outside the hobby is a car license plate. It's a unique combination of letters and numbers that identify an amateur. For example, my callsign is VK6FLAB, said phonetically, it's Victor Kilo Six Foxtrot Lima Alpha Bravo. We use phonetics because often individual letters are lost due to interference which comes in many different forms. Depending on where you are, a callsign might be subject to a renewal fee.

If doing a course and passing an exam seems scary, getting started at the introductory level is generally a weekend worth of effort. That introduces the notion that there are different levels, or to use an amateur phrase, classes, which, again depending on where you are, permit different access to the radio spectrum where your WiFi, mobile phone, garage door opener, emergency services, aviation, satellite and free to air television all share the same limited resources with radio amateurs. The higher your license class, the more access you get, but the more you become responsible for. Again, using a car analogy, you graduate from moped to car to truck.

If you've come across this hobby before, you should consider that one of the historic international license requirements hasn't existed for decades, namely Morse code. Mind you, some countries still require Morse, but their numbers are dwindling rapidly.

All podcast transcripts are collated and edited in an annual volume which you can find by searching for my callsign on your local Amazon store, or visit my author page: http://amazon.com/author/owh. Volume 7 is out now.

Feel free to get in touch directly via email: cq@vk6flab.com, follow on twitter: @vk6flab or check the website for more: http://vk6flab.com/

If you'd like to join a weekly net for new and returning amateurs, check out the details at http://ftroop.vk6flab.com/, the net runs every week on Saturday, from 00:00 to 01:00 UTC on Echolink, IRLP, AllStar Link, IRN and 2m/70cm FM via various repeaters.

If you'd like to participate in discussion about the podcast or about amateur radio, you can visit the Facebook group: https://www.facebook.com/groups/foundations.itmaze

This podcast episode was produced by Onno (VK6FLAB). You can find more at http://vk6flab.com/

There is an often repeated concept that amateur radio is old white men sitting in the dark talking to each other about the weather, their station and their ailments. While there's some of that around, you'll soon discover that there's people from all walks of life, all ages and interests and backgrounds. Given that this is a global experience, you do not need to limit your interactions to the people within your local community.

I've been contributing a weekly article about amateur radio since 2011. Detailing the many and varied aspects of this hobby and if you're curious about what you might find here, warts and all, jump in. There are two series of articles, "What use is an F-call?", which covers 2011 to 2015 when it was renamed to "Foundations of Amateur Radio". Available as an audio podcast, as text, as email and there are eBooks too.

You'll find plenty of amateur radio resources online and social media communities with different interests and sensibilities. As with any community, amateur radio has its share of gatekeepers who hark back to the days of yore, some literally, some in their language and behaviour. Don't let that dissuade you from exploring this magical community.

Feel free to drop me an email, cq@vk6flab.com and I'll do my best to answer any burning questions you're left with.

~ I'm Onno VK6FLAB

Internet access across HF radio

In the mid 1980's there was this thing called a Bulletin Board System or BBS. You would connect your computer to a gadget called an acoustic coupler that you would sit next to a telephone. You'd pick up the handset, dial a phone number and wait until there was a squeal in your ear. Then you'd push the handset into the rubber cups on the coupler and watch as your computer started putting characters on your screen.

Now, truth be told, my first foray was the next generation of this, an actual modem where you didn't actually have to touch the telephone, instead, the device could dial on your behalf using so-called AT commands.

And if we're being totally honest, I never actually connected to a BBS. My adventures with global communications started with Usenet News in 1990, but I'm here to make a point, I promise.

Amateur radio is a hobby that is for experimentation. One such experiment is a thing called packet radio. Before you roll your eyes about ancient technology, this gets very cool, very fast.

At its most basic, packet radio is about digital radio communication. Until not that long ago to play you needed a thing called a TNC or a Terminal Node Controller. When I got my license in 2010 I was told that this was a magic box to make digital communication possible between a radio and other radios and amateurs.

Right now, many people are playing with WSPR, Weak Signal Propagation Reporter as

well as FT8, both examples of things intended to get specific chunks of information exchanged between two stations. What if I want to chat, or send a file, or a picture?

There are tools like "js8call" which is experimenting with the idea of using FT8 to chat, but what if I told you that there's a better way?

Written by John WB2OSZ, named after a canine that became extinct 9,500 years ago, "direwolf", is software that implements an expensive piece of 1980's hardware, a TNC, that runs just fine on a $5 Raspberry pi. It's been around for over a decade, the oldest date I can find is March 2013 though undated versions before that exist.

It's an example of a so-called software-modem, simple to get started, and it implements the essential pieces of packet radio. It's currently running connected to my radio and I can see packets of information scrolling past. In this case I'm tuned to the local APRS, or Automatic Packet Reporting System frequency of 145.175 MHz.

It's the same information that you can see if you point your web browser at aprs.fi

While that's great, it's just the beginning. Tune to another 2m or 70cm frequency and you can use it to connect to a BBS being run by a local amateur, or, you can tune to a HF frequency and connect to one run somewhere else.

Direwolf also supports a technology called KISS, Keep It Simple Stupid, yes really, developed by Brian WB6RQN, Phil KA9Q, Mike K3MC and others. KISS allows you to connect a modem, like Direwolf, to a computer and use technologies like TCP/IP, the primary language of the internet, across a radio link, any radio link.

Let me say that again with different words. You can use your HF radio to browse the internet. No proprietary modes in sight, weak signal, error correction included, all open source, all free, all ready to go.

While we're singing its praises, direwolf can also act as an iGate, an interface between radio and services like aprs.fi, a digipeter that receives and re-transmits APRS data and plenty more.

It gets better.

What if you wanted to use something like RTTY, PSK31, Olivia or some other mode? You could use "fldigi" instead of direwolf since it too supports KISS.

To be fair, there are lots of moving parts here and I've glossed over plenty. This isn't intended to discuss precisely how to do this, rather that it's possible at all and has been for quite some time.

I can't wait to attempt to browse the internet using my radio, for nothing other than the thrill of attempting it.

I wonder if I can do this with Morse Code as the underlying protocol. Only one way to find out.

~ I'm Onno VK6FLAB

TIPS!

Need an antenna carrying case?

One of the hams at Dayton mentioned that they used drumstick bags to carry their portable antennas !!!

What a great idea! Cheap too!

Check out some examples on Ali-Express or your favourite online store !

73

Mike VE3MKX

Back to Basics

From The Canadian Basic Question Bank

Filters

Low, High, Bandpass and Bandstop

John Schouten VE7TI has been teaching amateur radio courses for over 20 years, and is the Course Coordinator for Surrey Amateur Radio Communications

The RF filters are essential in amateur radio for several reasons. They help to ensure that only the desired signals are received, filtering out unwanted noise and interference, and help to avoid nonlinear operation of the receiver's low noise amplifier. When transmitting, RF filters prevent signals from interfering with other spectrum users by allowing only specific frequencies to pass through, filtering out external noise and undesirable signals so they ensure that only the intended signal is transmitted.

There are several questions in the Canadian Amateur Radio Basic Question Bank that cover this subject. For example:

B-8-5-1 What type of filter might be connected to an amateur HF transmitter to cut down on harmonic radiation?

A. A high pass filter
B. A CW filter
C. A low pass filter
D. A key-click filter

B-8-5-7 To reduce energy from an HF transmitter getting into a television set, you would place a _____ as close to the TV as possible.

A. band reject filter
B. high pass filter
C. low pass filter
D. wave trap

The expectation

As a radio amateur you are expected to be able to identify interference, particularly to television and radio. Most of the time when interference occurs it is due to some fault in the receiver. Though as a licensed radio operator you will no doubt get the blame for everything, because if you were not there with your radio then the problem would not exist. I have also heard: *"we didn't have the problem until you moved in"*. Your neighbour, being non-technical, will not appreciate being told by you that the problem is theirs even if it really is. A better approach is to help them fix up 'the problem'. If worse comes to worse, then they can contact ISED (or the FCC in the US) and 'report' the problem. Let them; just make sure your house is in order first.

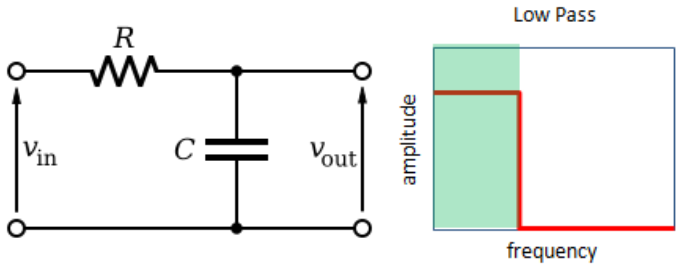
Let's also be clear that many of the problems associated with analog TV interference have disappeared since the advent of digital TV broadcasts. The next edition of the revised Canadian Question Banks will address and update these questions starting in 2025.

Lets examine interference and methods to reduce it

Electromagnetic interference (EMI), also called radio-frequency interference (RFI) when in the radio frequency spectrum, is a disturbance generated by an external source that affects an electrical circuit by electromagnetic induction, electrostatic coupling, or conduction. The disturbance may degrade the performance of the circuit or even stop it from functioning. EMI can be used intentionally for radio jamming, as in electronic warfare. It is a significant hurdle to enjoyable amateur radio use.

A **low-pass filter** allows signals below a certain cutoff frequency to pass through while attenuating (reducing) the strength of higher-frequency signals, which include these harmonics. By connecting a low-pass filter between the transmitter and the antenna, the filter effectively reduces the level of harmonic emissions, helping the transmitter comply with regulations and reducing the potential for interference with other radio services.

Harmonic radiation occurs when the transmitter generates unwanted signals at multiples of the desired transmission frequency. These harmonics can interfere with other communications and electronic devices.



A simple RC low-pass filter

A **highpass filter** in an amateur radio station serves to allow frequencies above a certain cutoff point to pass through while attenuating (reducing) frequencies below that point. Here are the key functions of a highpass filter in this context:

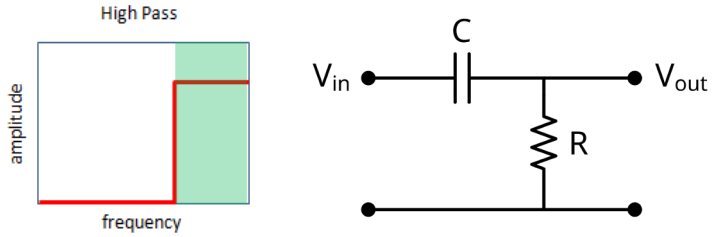
Harmonic Suppression: Highpass filters are often used to suppress lower-order harmonics generated by a transmitter. For instance, if an HF transmitter is operating on 14 MHz, it might inadvertently generate harmonics at 7 MHz (second harmonic) or 3.5 MHz (fourth harmonic). A highpass filter would block these lower frequencies, reducing harmonic interference.

Eliminating Low-Frequency Interference: Highpass filters can help remove unwanted low-frequency noise and interference from sources such as power lines or other electronic devices. This helps in improving the overall signal quality by allowing only the desired higher frequencies to reach the receiver.

Enhancing Receiver Selectivity: In some situations, a highpass filter is used in the front-end of a receiver to improve selectivity by attenuating signals that are below the operating frequency band. This ensures that the receiver only processes signals within the

intended frequency range, minimizing the chances of overloading or interference from strong signals at lower frequencies.

Protection Against RF Overload: Highpass filters can protect sensitive components in a receiver by blocking strong low-frequency signals that could potentially cause overload or distortion in the receiver circuitry.

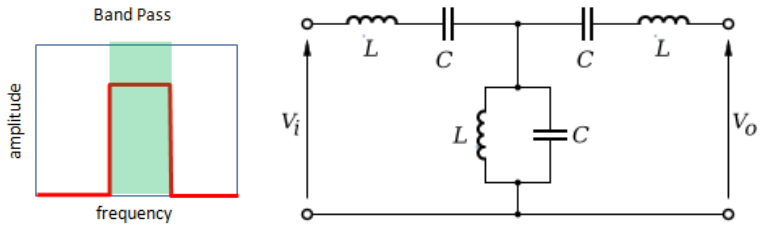


A simple RC high-pass filter

Therefore, a highpass filter in an amateur radio station is primarily used to suppress unwanted low-frequency signals and harmonics, improve signal quality, and protect equipment from interference or overload.

A **bandpass filter** in an amateur radio station serves the function of allowing signals within a specific frequency range (or band) to pass through while blocking or attenuating signals outside of that range.

Selective Reception: It ensures that the receiver only picks up signals within the desired amateur radio band, reducing the chances of interference from signals on other frequencies.



A medium-complexity example of a band-pass filter

This is particularly important in crowded bands or in environments with a lot of RF noise.

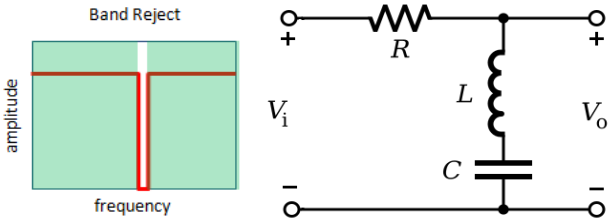
Harmonic Suppression: In transmitting, a bandpass filter can help limit the emission of unwanted frequencies, such as harmonics, which could cause interference with other communications or violate regulatory requirements.

Improved Signal Quality: By filtering out unwanted frequencies, the bandpass filter helps improve the overall signal quality and clarity, making it easier to hear and decode the desired transmissions.

Preventing Intermodulation: It reduces the risk of intermodulation distortion, which can occur when strong signals on nearby frequencies mix and create spurious signals within the band of interest.

In essence, a bandpass filter is crucial in maintaining the integrity and quality of communication within the amateur radio bands, ensuring that both transmission and reception are clear and free from unwanted interference

A **bandstop filter** (also known as a notch filter or band-reject filter) in an amateur radio station is used to block or attenuate signals within a specific frequency range while allowing signals outside of that range to pass through.



A simple bandstop (reject) filter

Interference Rejection: The primary purpose of a bandstop filter is to reduce or eliminate interference from a specific frequency or narrow range of frequencies.

For example, if there is an interfering signal or noise source at a particular frequency, the bandstop filter can be tuned to attenuate that frequency, preventing it from affecting the desired communications.

Harmonic Suppression: While a bandpass filter helps in harmonic suppression by allowing only the desired band to pass, a bandstop filter can target and reduce specific harmonics or spurious emissions that may be causing interference, without affecting the primary transmission frequency.

Improving Signal Quality: By removing unwanted frequencies, especially strong interfering signals, a bandstop filter can significantly improve the quality and clarity of the signals being received or transmitted, leading to more reliable communication.

Protection of Equipment: In some cases, strong unwanted signals at specific frequencies can overload the receiver's front end or cause other equipment issues. A bandstop filter can protect the station's equipment by attenuating these signals before they reach sensitive components.

So, a bandstop filter is an important tool in an amateur radio station for managing and mitigating interference from specific unwanted frequencies, thereby enhancing the overall performance of the radio system.

Summary

In an amateur radio station, various types of filters are essential to manage and control the frequencies in transmission and reception. Among these, **high-pass filters** are particularly useful for ensuring signal clarity and reducing interference. A high-pass filter allows frequencies above a certain cutoff point to pass through while attenuating (reducing) the strength of frequencies below that point. This function is crucial for harmonic suppression, especially in situations where a transmitter inadvertently generates lower-order harmonics that can interfere with communication. For example, an HF transmitter operating on 14 MHz may produce harmonics at 7 MHz or 3.5 MHz, which a high-pass filter effectively blocks

Low-pass filters, on the other hand, are used to curb harmonic radiation by allowing signals below a specific cutoff frequency, typically around 30 MHz, to pass while attenuating higher frequencies. This is particularly important to ensure compliance with regulations and prevent interference with other communication systems.

Band-pass filters serve to isolate a specific range of frequencies, allowing only signals within this range to pass through while blocking those outside of it. This selective reception is vital in crowded RF environments to reduce interference from signals on adjacent frequencies.

Finally, **band-stop filters** or notch filters are used to attenuate signals within a specific frequency range, effectively rejecting interference from unwanted signals, thereby improving overall signal quality.

Together, these filters play a critical role in maintaining the integrity and clarity of communications in an amateur radio station, ensuring that transmissions are clear, compliant, and free from unwanted interference… and frustration.

So what are the answers to our sample questions?

B-8-5-1 What type of filter might be connected to an amateur HF transmitter to cut down on harmonic radiation?

C. A low pass filter

Explanation: key word: HARMONIC. 'Harmonic Radiation' (integer multiples of the operating frequency). A 'Low-Pass' filter with a cutoff frequency of 30 MHz helps curb harmonics out of an HF transmitter.

B-8-5-7 To reduce energy from an HF transmitter getting into a television set, you would place a _____ as close to the TV as possible.

B. high pass filter

Explanation: A 'High-Pass' filter is used on a TV receiver to prevent overload from an HF transceiver.

~ John VE7TI

SEPTEMBER 2024

Sun	Mon	Tue	Wed	Thu	Fri	Sat
1	2 **Labour Day** 	3 1930 SEPAR Net **2000 SARC Net**	4	5 **2000 SARC GOTA Net**	6	7 **Coffee:** 0700 Denny's 6850 King George Blvd., Surrey **OTC NOT OPEN**
8 RunSurreyRun! 0730—Noon **OTC NOT OPEN**	9	10 1930 SEPAR Net **2000 SARC Net**	11 **SARC Meeting** 1900-2100	12 **2000 SARC GOTA Net**	13	14 **Coffee:** 0700 **OTC Open** 0930—Noon **Contest:** WAE DX (SSB)
15 **Contest: WAE DX (SSB)**	16	17 1930 SEPAR Net **2000 SARC Net**	18	19 **2000 SARC GOTA Net**	20	21 **Coffee:** 0700 **OTC Open** 0930—Noon **Contest:** WA State Salmon Run (CW, phone)
22 **Contest:** WA State Salmon Run (CW, phone) **Delta ARS swap meet**	23	24 1930 SEPAR Net **2000 SARC Net**	25 **SARC Directors Meeting** 1900-2100	26 **2000 SARC GOTA Net**	27	28 **Coffee:** 0700 **OTC Open** 0930—Noon **Contest:** CQ WW DX (RTTY)
29 **Contest:** CQ WW DX (RTTY)	30 **SARC Basic Course**	1	2	3	4	5

SARC Official Calendar

Your official reference for dates and times of events is the SARC Google Calendar, which is updated as details change, so please consult it for last minute confirmation: https://calendar.google.com/calendar/u/0/embed?src=ve7sar@gmail.com&ctz=America/Vancouver

OCTOBER 2024

Sun	Mon	Tue	Wed	Thu	Fri	Sat
		1 1930 SEPAR Net 2000 SARC Net	2	3 2000 SARC GOTA Net	4	5 **Coffee:** 0700 Denny's 6850 King George Blvd., Surrey **OTC Open** 0930—Noon
6	7 SARC Basic Course	8 1930 SEPAR Net 2000 SARC Net	9 SARC Meeting 1900-2100	10 2000 SARC GOTA Net	11	12 **Coffee:** 0700 **OTC Open** 0930—Noon
13	14 Thanksgiving No SARC Basic Course 	15 1930 SEPAR Net 2000 SARC Net	16	17 10:17AM Great Shake-Out 2000 SARC GOTA Net	18	19 **Coffee:** 0700 **OTC Open** 0930—Noon
20	21 SARC Basic Course	22 1930 SEPAR Net 2000 SARC Net	23 SARC Directors Meeting 1900-2100	24 2000 SARC GOTA Net	25	26 **Coffee:** 0700 **OTC Open** 0930—Noon **Contest:** CQ WW DX (SSB)
27 **Contest:** CQ WW DX (SSB)	28 SARC Basic Course	29 1930 SEPAR Net 2000 SARC Net	30	31 2000 SARC GOTA Net	1	2 Antenna Workshop

SURREY AMATEUR RADIO

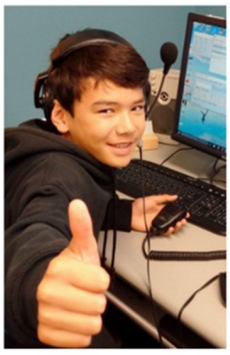
basiccourse

OBTAIN YOUR FEDERAL AMATEUR RADIO CERTIFICATE

7-WEEKS · ON-LINE · $80

Our next on-line course starts September 30

Includes classes, a comprehensive manual, videos and the exam fee



- Ideal for outdoors activities. Long range communications anywhere for free without commercial infrastructure
- Enhance your personal and your community's preparedness in an emergency
- Use satellite communication to speak around the world, perhaps even to an astronaut
- Use a radio, computer, smartphone or tablet for free worldwide voice and digital communications
- Participate in 'Radio Sports' like Contesting and Hidden Transmitter Hunts
- Practice an exciting hobby or start a career opportunity

City of Surrey
separ
Surrey Emergency Program Amateur Radio
https://separ.ca/

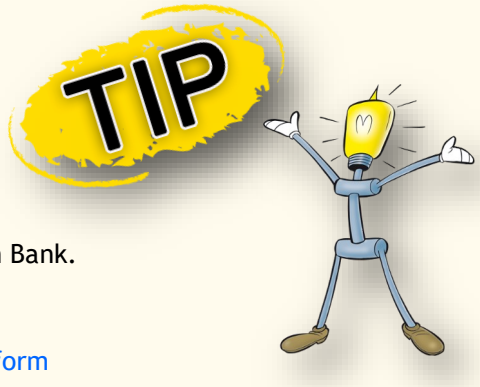
SURREY SARC

SARC
Surrey Amateur Radio Communications
http://ve7sar.net

Did you get your Amateur Radio certificate within the past year or two and want to introduce yourself through TCA to the Amateur Radio community? If so we would love to hear from you.

Drop a line to tcamag@yahoo.ca and tell us how you were introduced to the magic of Amateur Radio. Do you credit any particular Amateur ("Elmer") with getting you started? Which aspect of the hobby do you enjoy so far?

Please be sure to include your name, call sign, date and level of certificate - and don't forget to include a photo or two. We hope to hear from you soon!



Study Links for more information

Whether you are new to the hobby or brushing up on skills, you should find these study links helpful:

1. RIC-7 is the entire up-to-date Industry Canada (IC) Basic Question Bank. http://tinyurl.com/CanadaBasicQB
2. Industry Canada (ISED) on-line practice page: https://apc-cap.ic.gc.ca/pls/apc_anon/apeg_practice.practice_form
3. The Amateur Radio Exam Generator is at: https://www.ic.gc.ca/eic/site/025.nsf/eng/h_00040.html
4. The ExHaminer Study software for Windows is at: https://wp.rac.ca/exhaminer-v2-5/

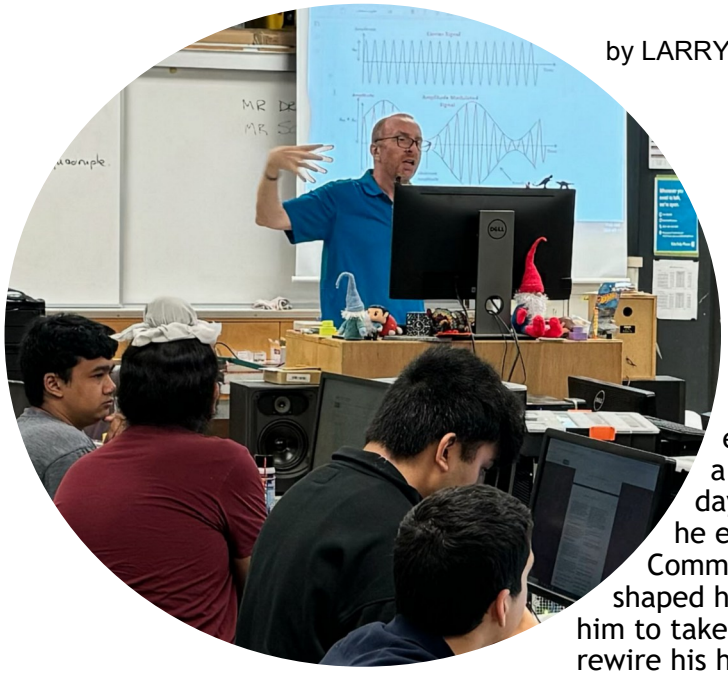
Contact SARC if you wish to write the Basic or Advanced Exam. If you pass we'll even give you a year free as a SARC prospective member!

Newly Licensed? When you receive your paper license in the mail, it will come with a form that can be filled out and mailed to the Radio Amateurs of Canada office, at which point an introductory RAC one-year membership will be set up. Introductory memberships are identical to our existing basic memberships and you will receive The Canadian Amateur magazine for one year.

Profiles of SARC members

Meet Adam Drake VE7ZAL

by LARRY BLOOM VE7LXB and JOHN SCHOUTEN VE7TI



Adam Drake VE7ZAL from England to Canada

—A journey of adventure and teaching

At 57, with 32 years of marriage and teaching experience under his belt, Adam has lived a life full of adventure and challenges, shaped by his passion for education and a love for exploration. Born and raised in the UK, Adam was a self-proclaimed nerd, deeply involved in the early days of home computing. As a teenager in the 1980s, he embraced the era of the Sinclair ZX80, ZX81, Commodore 64, and the BBC Microcomputers that shaped his understanding of technology. His curiosity led him to take these machines apart, modify them, and even rewire his home phone system, all in pursuit of learning and experimentation.

Though not much of a sports enthusiast, Adam found value in judo during his teenage years. The local judo club was more than just a physical activity; it was a place where he developed social skills, built relationships, and grew as a person. These experiences, coupled with his academic journey, have shaped the well-rounded individual he is today.

Adam studied Electronics at Leeds University in the late 1980s and, right after getting married in 1992, he began his teaching career. He and his wife decided it was time for a change, leading them to China. They spent a year teaching spoken English in Guiyang; a city known for its history of being a place of exile during the Cultural Revolution.

This experience added a unique dimension to their lives, exposing them to a different culture and way of life at a young age.

They returned to the UK, but after a few years of teaching there, they decided to move to Canada. The decision to move to Ottawa instead of Vancouver was a significant one, marked by the harsh reality of six months of snow each year. However, they embraced the challenge, and Adam continued his teaching career, focusing on technology and computing. He even became qualified to teach the Cisco Networking Academy, a testament to his commitment to staying ahead of the curve in education.

After five years in Ottawa, the family returned to the UK, where they spent the next fifteen years in Exminster, a beautiful small town in Devon. During this time, Adam continued to teach high school, raising three children with his wife. When their two eldest children were ready for college, the family decided it was time for another adventure. In 2017, they held a family meeting and decided to move back to Canada, this time to Vancouver, a bold decision because it was made without securing a job beforehand. Adam began contacting school districts, unaware of the differences in the hiring processes between the UK and Canada. In the UK, schools could hire at any time, but in Canada, the process was different, it had to happen during summer break. Despite the uncertainty, they sold their house, quit their jobs, and made the move. After several interviews, Adam accepted a position with the Surrey School District, specifically at Kwantlen Park Secondary. Upon his arrival in 2018, he noticed there was no electronics program at the school, something he was passionate about teaching.

Adam initially taught drafting however, his passion for electronics soon led him to introduce a new program at the school. His enthusiasm for teaching in Canada was palpable; he found the educational environment in British Columbia to be vastly different and more enjoyable compared to the UK. He appreciated the less administrative and more engaging approach to education, which allowed him to fully immerse himself in his work. The natural beauty of British Columbia, coupled with the warm and welcoming Canadian lifestyle, made him feel truly at home.

Adam on a typewriter in China… no technology for him.

While Adam's focus was on establishing himself in his new environment, his wife secured a job at Douglas College shortly after their arrival. The couple's three children also adapted to their new surroundings. Their daughter enrolled directly at Simon Fraser University (SFU), while their son initially started at SFU but later transferred to Douglas College after finding his passion elsewhere. Their youngest child entered Grade 10 at a local high school, further integrating the family into their new community.

Adam Drake's mind works in a unique way—a fact he has come to accept over his 57 years. His brain works in a way that is driven by intense bursts of enthusiasm. He dives deep into a subject, immerses himself in it, and then, once the initial excitement wanes, he moves on to something else. Over the years, he has learned to accept this about himself. He has picked up and put down countless hobbies, always chasing the next thing that piques his interest. For instance, he recalls his foray into remote control aircraft. At first, he was captivated, even acquiring all the necessary equipment. But eventually, the excitement waned. "I

found it really boring," he admits. The challenge was there, but once conquered, the repetitive nature of the hobby led him to lose interest.

Despite the graveyard, Adam has found lasting success in other areas. His interests in electronics, particularly microprocessor programming with Arduinos, Raspberry Pis, and Micro computing have stayed with him. By integrating these interests into his curriculum, he keeps the flame alive and continues to explore new avenues within this field. Amateur Radio is another example of how he seeks to combine his interests in computing, electronics, and communication. Although his children, especially his son Gabe, may not fully understand this hobby, they occasionally witness him experimenting with his equipment at home. Adam finds himself still at the beginning stages, eager to discover the many facets of the hobby. Whether it's the technological challenge, the practical aspect of using his equipment in a high-rise apartment, or the social community that comes with it, he sees endless possibilities.

Adam and his wife Karrie.

Currently, Adam is deeply involved in running a competitive robotics club at his school. This club, which competes at the provincial level, demands much of his time and energy. Additionally, Adam's passion for Skills Canada—a national competition, takes up a significant portion of his year. He is a key figure on the national committee and is heavily involved in organizing and preparing for student robotics events.

A self-described lifelong learner, he recognized a gap in his knowledge—radio frequency (RF) technology. Although he had studied electronics at Leeds University, RF had always been a challenging area. Over the years, this unmastered aspect of electronics lingered in his mind, becoming a personal challenge he was determined to overcome. About a year and a half ago, Adam decided to tackle this challenge head-on by obtaining his amateur radio certificate. He reached out to various organizations, including Radio Amateurs of Canada (RAC), and eventually found the course he needed. Recognizing that he learns best in a structured environment, Adam enrolled in a course with Surrey Amateur Radio Communications (SARC). After getting his amateur radio certification, Adam bought his first radio, made a contact or two, and hit a repeater. Despite the technical challenges of operating a Amateur Radio from the 10th floor of a concrete apartment building, Adam persevered.

For Adam, the process of discovering a new interest is exhilarating. As he puts it, once he latches onto something, he runs with it, becoming wholly absorbed, and this was the case with Amateur Radio. While many might see it as a hobby, Adam knew right away that it was more than that. It was a passion waiting to be explored… a hobby of hobbies. He quickly realized that there was a vast area of electronics and technology that was not being covered in high schools, technology that could lead to successful careers. His mind immediately began racing with ideas

about how to teach it. Adam quickly recognized the value of having a mentor, and John VE7TI, an experienced instructor and advocate of gaining younger talent in the hobby, became a sounding board. Adam proposed the idea of an RF Communications Summer School class that would integrate an opportunity for students grade 8 to 12 to obtain their Amateur Radio qualification. As a full-time electronics teacher in a district with 21 high schools, Adam is somewhat of a rarity. He is one of only three teachers of electronics, the other two are primarily robotics teachers with a bit of electronics on the side. This makes him uniquely positioned to introduce his students to the fascinating world of radio. While Adam is eager to integrate Amateur Radio into his teaching, he also has personal ambitions within the hobby. He is particularly interested in Software Defined Radio (SDR) because it aligns with his background in computing and electronics. SDR offers the versatility he craves and allows him to explore a wide range of frequencies with a lower investment cost.

In Adam's world, hobbies are more than just pastimes—they are avenues for discovery, learning, and connection. With a curious mind and a commitment to purpose, he continues to explore the vast landscape of his interests, ever eager to see where they will take him next. Adam's family has learned to support these ever-changing interests. His wife, whom he describes as an absolute doll,

takes a step back and lets him pursue whatever works for him. She has seen the graveyard of past hobbies, but she has also witnessed the passions that have stuck with him. Her own passion for theatre was put on hold as they raised their children, but now, with their youngest showing promise as an actor, she is cautiously stepping back into the world of acting, albeit without stealing the spotlight from their son.

Today, Adam continues to teach with the same enthusiasm that drove him to pursue his career in education all those years ago. His journey from the UK to Canada, with a detour through China, is a testament to his adventurous spirit and dedication to his craft. He has not only embraced change but has also used it as an opportunity to grow both personally and professionally, leaving a lasting impact on the students and communities he has served.

~ Larry VE7LXB
John VE7TI

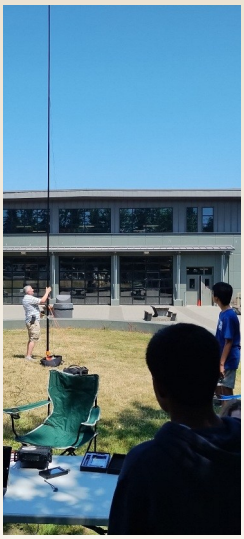
Photos of the 2024 RF Communications summer high school course in Surrey

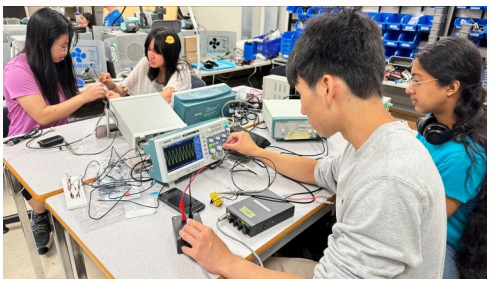
July & August 2024

SARC Summer Socials

"Hams across the border" organized by the Burnaby ARC

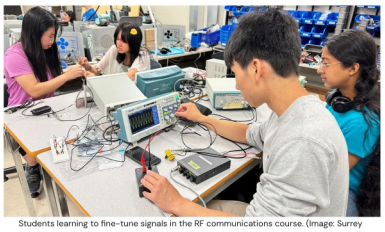
And some more photos from the July RF Communications summer school





Surrey Schools students take to the airwaves in new RF communications course

A group of Surrey students is spending part of their summer break learning about radio frequencies in a new electronics course that may be the first of its kind in Canada.



Students learning to fine-tune signals in the RF communications course. (Image: Surrey Schools)

Held at Kwantlen Park Secondary this month, the RF communications course introduces students to radio frequency technology and allows them to earn their Amateur Radio Certification. For its debut year, the course has 23 Grades 8 to 12 students enrolled.

"As far as I know, there aren't any other courses like this for high school students in Canada," said course founder and instructor Adam Drake.

Assisting Drake with the course is volunteer and amateur radio enthusiast John Schouten, who currently serves as a director for Surrey Amateur Radio Communications. A retired member of the Vancouver Police Department, Schouten oversaw the implementation of many of the force's radio technologies and remains heavily involved in the local amateur radio scene.

"Our goal is to keep the service alive by introducing it to younger generations," he said. "When people picture amateur or HAM radio, they usually picture an old guy sitting with a morse code key, but there are so many career opportunities to pursue in this field."

Those opportunities include everything from electrical or waterwork systems, utility controls and aerospace, said Schouten.

"We've seen the students experience some real revelations about how integrated radio is with our day-to-day lives," he said. "They've also been amazed at the capabilities of the technology with even the most basic equipment."

An example, said Schouten, was an antenna he had created out of some PVC pipe and a chopped-up tape measure. Using pieces of the tape measure's metal blade, Schouten was able to create an antenna that could reach the International Space Station.

Another key part of the course is teaching students about the vital role radio operators would play in the event of a regional emergency.

"We have a lot of people interested in the emergency communications aspects of it," said Schouten. "There are regional emergency service plans set up with organizations like hospitals, the Red Cross, the Salvation Army, and in the event of a large-scale emergency where commercial infrastructure goes down, it would be amateur radio operators that would come in with their own equipment to setup those communication lifelines."

It is for this reason that Grade 9 student Ojasvi Ashutosh signed up for the course.

Ojasvi Ashutosh signed up for the course to learn how to help out in emergency situations. (Image: Surrey Schools)

"I know that radios are the only way people are going to be able to communicate in an emergency," she said "If there's an EMP (electromagnetic pulse) and all of our devices stop working, I want to be one of those people that can help."

While initially interested in computer sciences and coding, Ashutosh said she developed a curiosity for circuitry and hardware after her science teacher at Sullivan Heights Secondary taught a unit on physics and machinery.

"I was just fascinated with how you could harness energy and use it in so many ways given the right circuits or machines," she said. "It's been surprising to see how much radio communications are integrated into our lives with things like Bluetooth and even our cellphones, they're basically fancy radios."

Next Tuesday, the class is also planning to launch a balloon of radio equipment to demonstrate altitude, range and tracking using radio frequencies.

14033 92 Avenue
Surrey, B.C. Canada V3V 0B7 View Map

Get in touch with us
604-596-7733

Email
feedback@surreyschools.ca

Find Your School | Register Today

Surrey Schools
LEADERSHIP IN LEARNING

How to read the tag on a BC Hydro Pole

Every BC Hydro pole in British Columbia has a metal (or plastic) identification tag. Located at or near the base of the pole, these tags are a great radio resource -- they provide what appears to be very accurate longitude and latitude data. The example shown above is from the pole at my driveway. The important bit of data is the number series highlighted in the red box. Here's how to read the data...

The first four numbers are longitude -- in this case 123 degrees, 35 minutes West (the 1 is dropped) and the next four are latitude 48 degrees, 41 minutes North. The remaining four numbers 2742, refer to a province-wide location map file on which the pole is plotted.

The lower line of numbers further pinpoints the pole's geographical position for BC Hydro.

So how accurate is the data you ask? Thanks to Earl, VE7IN and his GPS unit, I can tell you the pole tag at my QTH is very accurate. Using his GPS, Earl calculated my coordinates as 123 degrees, 35 minutes West by 48 degrees, 41 minutes North -- an exact match to the tag.. To test the accuracy at another location, Earl has checked the pole at his QTH and once again the pole tag data is accurate when compared to the GPS readings.

This handy resource provides a method to verify your coordinates -- regardless of where you are in the province.

My thanks to Stan VE7SAG for describing how to read the tag.

~ Paul Peters VE7BZ

Social Reminder

The Saturday weekly social gathering is once again 'on' at the Denny's Restaurant, 6850 King George Blvd., Surrey BC from 07:30—09:30. All are invited. Afterwards, we will host workshops and will be available to invigilate Amateur Radio exams at the OTC, 5756—142 Street, Surrey from 10-noon.

Bring your ham issues, our Elmers will try to help you sort them out.

SEPAR

U.S. National Preparedness Month and PACE

by GORD KIRK VA7GK

This month we may hear many messages about being prepared and emergency preparedness as our US neighbors recognize September as National Preparedness Month. In Canada we have “Emergency Preparedness Week” during the month of May.

Whether it is the US influence in Canada or our own Canadian EP week it is always a good reminder that we should be prepared. SEPAR (Surrey Emergency Program Amateur Radio) has the specific focus of planning and helping with preparedness to aid in communications should normal communications methods fail. As part of the local Surrey Amateur Radio Communications (SARC) club we take our hobby and look at how we could help with communications if needed.

This does take a club of active members to make a healthy program. All the events, from socials to workshops, help build relationships, generate ideas, and take individuals areas of interest to help build creative solutions to help with emergency communications. A small group interested in Meshtasic, or VARA for Winlink can help others understand how this works and can be applied to passing messages when needed.

Often just the basics of helping a newly licensed amateur get on the air, use a repeater, or get a home HF station with a limited antenna on the air are some of the best things we can do. Remembering this is meant to be a fun hobby, and having active radio operators is one of the best things a club can do.

Gord Kirk VA7GK is a SARC Director and the SEPAR Coordinator

October 17th 10:17 am

This is the day millions of people worldwide will practise how to "Drop, Cover and Hold On" during Great ShakeOut Earthquake Drills.

The Great British Columbia ShakeOut, organized by the British Columbia Earthquake Alliance (BCEA), is an annual opportunity for individuals, communities, schools, and organizations to practice essential earthquake safety measures such as "Drop, Cover, and Hold On." Beyond the drill, participants are encouraged to critically review and update their emergency preparedness plans and supplies, while also taking proactive measures to secure their spaces and prevent potential damage and injuries.

The BC Earthquake Alliance (BCEA) is a not-for-profit society whose mission is to build a culture of earthquake and tsunami preparedness. For more information about the BC Earthquake Alliance, please visit bcearthquakealliance.ca.

The Great British Columbia ShakeOut™

Weekly nets are "practice" sessions, as are contests. Each of these ensures working equipment and a more experienced operator. Knowing we could help with disaster communications is also a good reminder for each of us to be personally prepared.

Of course, the basics of having a prepared home include food, water, alternative methods to stay warm (or cool), alternative light sources, medical needs etc. All these basic preparedness items, lists, plans etc. are easily available with a simple internet search. For the radio operator we also include alternate ways to power our radios (or recharge batteries), knowledge on how to program and use our radios and what the local amateur community will do in an emergency. We should know the main repeaters around the area and their coverage footprint. We should have an idea of our radio reach without a repeater (simplex). We should have an idea of how long we can run our radio on alternative power etc.

Each of us should have a personal Family Communications Plan and your Emergency Communications Group should also have a communications plan for the organization. One of the easiest ways to build these is using a PACE Plan. PACE stands for:

Primary (what is your normal day to day method of communications? Cellular, Text (SMS) etc.?

Alternate (If the primary above is not working what would you do next? Internet based communication like WhatsApp, Facebook Messenger etc.)

Contingency (Things are not working so you go to radio (frs/gmrs, cb, ham) or satellite phone or messenger.

Emergency Plans. (A predetermined meeting location or message on a board etc.)

These above examples are just that, examples. The idea is most of us use cellular based communications each day so that will likely be the first option. If cellular is not working but the internet is up, have you an app or agreed upon method to message one another.

If you go to radio, do you have a time, a frequency (repeater) etc.? Have you thought about having as out of area contact as you might be able to contact them and use them to relay messages etc. The point is taking some time think this through and write it down on a card, put a pdf on your phone etc.

This same principle works for your Emergency Communications group. In Surrey we meet each week on the net and as part of it go to simplex or another repeater to make sure people know what to do, and how their radios work. Each week the net controller reminds people that in an emergency we will use the repeater and if it fails, we will go the local agreed upon Simplex Frequency.

The SEPAR and SARC net scripts are available on the website if you are wanting an example of how we run the nets. See www.ve7sar.net

As we finish summer vacations and many of us go back into fall routines with work, school etc. it is a good time to be reminded of this communication plan need. Many of us have the 72 hours plus emergency preparedness covered and don't have a simple, no cost communications plan developed. I encourage you to help your family and friends to build a PACE plan, in fact if you do this and share it with your family it may help highlight other areas your family is concerned about.

As always please reach out if you have any questions or comments or if you would like to participate in the SEPAR program within Surrey.

~ Gord Kirk (VA7GK).
SEPAR Coordinator

Regional Frequency Plan

Name	Frequency	Offset	CTCSS
VE7RSC (Primary Repeater)	147.360	+0.600	110.9
VE7RSC (Secondary Repeater)	443.775	+5.0	110.9
VE7RPT (Primary Regional Repeater)	146.940	-0.600	Optional 136.5 Rcve
Simplex 1	(VHF) 146.550		
Simplex 2	(VHF) 147.420		
Simplex 3	(UHF) 446.550		
Simplex 4	(UHF) 447.425		

Other frequencies in the Greater Vancouver area:

Primary: Coquitlam/Abbotsford 146.430
Primary: Inter-Municipal Group 3 146.445
Primary: Vancouver; Mission; Sec. Coquitlam 146.460
Primary: Kent-Mission; Sec. Richmond 146.475
Primary: Inter-Municipal Group 2 146.490
Primary: New West; Sec. Richmond 146.505
National Calling / FM Simplex Group I 146.520
Primary: North Shore; Port Coquitlam 146.535
Primary: Bowen Island; Surrey 146.550
Intermunicipal Group 1 Coordination 146.565
Primary: Lions Bay/Vancouver/Delta/Langley 146.580
Primary: Port Moody; Sec: Burnaby 146.595
Secondary: Vancouver/Surrey 147.420
Secondary: Vancouver (UBC) / Maple Ridge 147.450
Primary: White Rock/Chilliwack; Sec. No. Shore 147.480
Secondary: Burnaby/Pitt Meadows 147.510
Primary: Delta; Sec: Abbottsford 147.540
Primary: Hope; Sec: Delta; ALSO EMBC 147.570

separ
Surrey Emergency Program Amateur Radio

WANTED

★ ~~DEAD or~~ ALIVE ★

ICOM IC-7000

Looking for a well looked after Icom IC-7000 transceiver from a non-smoking home.

If you have one that is not getting a lot of use stashed away in your radio room/trailer/cabin I would be interested in buying it from you.

I intend to use this in a go-bag and to get out doing Parks On the Air (POTA) activations.

Please contact me at va7jdj@gmail.com if you have what I am looking for.

REWARDS ~~$1,000,000~~

TBD

Reprint Policies

These are policies for reprints from The Communicator, a bi-monthly journal about amateur radio and other topics published by Surrey Amateur Radio Communications (SARC).

You may use articles authored by SARC members for your club newsletter or other amateur radio publication, provided that the purpose is non-commercial, you credit the author, and provide a link as follows: https://ve7sar.blogspot.com/search/label/SARC%20Communicator. If our article indicates it is from a source outside of SARC, we cannot transfer that right, and you must seek permission to re-publish from the original source. We appreciate being notified via email to communicator@ve7sar.net if one of our original articles has been re-printed elsewhere.

We welcome your comments and feedback

Please consider leaving a comment via email to communicator@ve7sar.net, or on our blog site https://ve7sar.blogspot.ca or, better yet, contact our authors directly, so they know someone is out there reading our publication.

Joe Kloc VE7HJK (SK)

We're sad to report that we have lost another long-time SARC member.

Joe Kloc VE7HJK passed away a few weeks ago after a lengthy illness.

Joe (left) with Fred VE7MPI and Anton VE7SSD

SARC news…

RunSurreyRun event Sept. 8th.

We are looking for Amateur Radio volunteers for the third annual RunSurreyRun which takes place on **Sunday, September 8, 2024** at Holland Park in Surrey, from **7:30am until approx. noon**.

Radio-equipped SEPAR volunteers will be distributed throughout the route at Aid Stations and other points. They are in touch with our Communications Command Trailer at Holland Park and our communications volunteer at the City Hall EOC.

The only requirement is that you have an adequate portable transceiver with power and an antenna. We use the SARC Surrey North repeater, which is only a few blocks away and last year there were no path problems. If you have a mobile radio and your position is suitable for its deployment, so much the better.

If you can assist, please confirm via email to SEPAR@ve7sar.net. The event website: https://www.runsurreyrun.com/

Celebration of Life for Erich Burr (Sept. 21)

Please see: https://www.dignitymemorial.com/obituaries/surrey-bc/erich-burr-11846990. SARC members and friends of Erich are welcome to attend.

Looking for Donations of VHF/UHF Handheld Radios

Adam Drake, the instructor for the summer radio electronics course of the Surrey School Board is looking for donations of VHF/UHF radios (handheld, mobile or base station) for graduates of the course. Please contact Adam at ve7zal@gmail.com if you have a spare that you are willing to donate.

New Monthly 220 MHz Net

Reg VA7ZEB has organized a new 220 net taking place at 7:30pm on the last Sunday of every month on VE7RSC 223.960MHz -1.6MHz tone 110.9Hz. Net Control is Shawn VE7BD. This is not a "chat" net – just check in, exchange signal reports, and get on with your evening.

Contest Group

If you are interested in joining the contest group, or just prefer to operate the club station radios on your own time, please reply to membership@ve7sar.net.

Coaching will be provided as needed during scheduled contests. See WA7BNM Contest Calendar: Home for a complete list of available contests.

In-Coming QSL Bureau

Any member wishing to receive in-coming QSL cards via the club should send Ken VE7BC an email (ve7bc27@gmail.com) or call/text him at 604-816-5775 and the cards will be collected for distribution to the member by Shawn VE7BD. Or, if you are simply wondering if Ken has any cards for you please contact him.

Projects Group (Host Dino VE7NX)

Satellite Project: The satellite station is now set up in the Radio Room and available for members to use. If you wish to schedule a time to make satellite contacts, email John VA7XB at membership@ve7sar.net or just show up Saturday mornings. Please reply to this email if you wish to join the Projects Group and participate in the construction of other ham radio projects, but are not already registered. No projects are currently scheduled for the summer months.

CW Tutoring (Hosts Dino VE7NX and John VA7XB)

This is for members who have passed the CW exam and want to upgrade their skills in making contacts on the air. Further sessions will be scheduled in the Fall, subject to demand.

Advanced Amateur Forums (Host Reg VA7ZEB)

forums.AdvancedAmateur.ca is a friendly online community focused on advanced ham radio topics like Meshtastic/LoRa, GNU Radio, satellite, spurious emissions, legal issues, and obtaining the Advanced Amateur Certification.

Free VE7DXE Advanced Certification Course: **Unsubscribe Option**. To discontinue receiving bulletins or, if you are receiving them in duplicate, please reply to this email with either UNSUBSCRIBE or DUPLICATE COPY in the subject heading, and the distribution list will be revised accordingly. ve7dxe@hamshack.ca

73, John VA7XB membership@ve7sar.net

Ham Leftovers...

Ham on a Bicycle

Have you ever thought how exciting it would be to talk to a Pilot of a Commercial Jet Airliner using a Ham Radio? How about doing it while riding your Bicycle? Well it can be done and I'll show you how I did it. Watch it on YouTube: https://youtu.be/I6YLW5jOs10?si=eDyCZ4Wfhq_v6Sxg

Moonbounce music

There's something inspiring about echos. Who among us hasn't called out or clapped hands in a large space just to hear the sound reflected back? Radio takes this to a whole new level. You can bounce signals from buildings, aircraft, the ionisphere, or even the Moon itself. Humans have been bouncing radio waves from the moon for decades. It's been used at war, and in peacetime. But [Hainbach] might be the first to use it for music.

An HOA regulations work-around

The US and a few other countries have an astounding array of homeowners' associations (HOAs), local organizations that exert an inordinate influence on what homeowners can and can't do with their properties, with enforcement mechanisms up to foreclosure. You can imagine the problems they'd have with things like ham radio antennas. [Bob] aka [KD4BMG] has been working on tuning up his rain gutters to use as "stealth" antennas to avoid any conflicts with his HOA. Read further at: https://hackaday.com/2024/08/27/hidden-gutter-antenna-keeps-hoa-happy/

A UPS on steroids

If you've got a so-called uninterruptible power supply (UPS) on your system, you're probably painfully aware that the "uninterruptible" part has some pretty serious limits. Most consumer units are designed to provide power during a black out only long enough to gracefully shut down your system. But with a few hacks like these, you can stretch that time out and turn it into a long-endurance UPS. Read further at: https://hackaday.com/2023/12/15/mods-turn-junk-ups-into-a-long-endurance-beast/

Is it a scientific breakthrough, science fiction or a hoax?

Can a wet noodle really be used as an antenna? Watch this video and decide: https://www.youtube.com/watch?v=9EmDv-mmnOw

We're QRT

3D printing

Have you discovered it yet?

by STEVE HARVEY VE3EZB

Steve Harvey VE3EZB is newsletter editor for the Seaway Valley Amateur Radio Club

I generally write this column as the final segment of each Communicator—hence the name QRT (ending transmission). In this issue, I am including a piece that I found in the newsletter of the Seaway Valley Amateur Radio Club, located in Cornwall, Ontario, Canada. The SVARC has been in existence since it was formed on June 18, 1960. The club operates several repeater sites.

I thought it an appropriate piece because I'm seeing more and more excellent projects that include some form of 3D printing and I'm planning a future issue that will include lots of additional information—Ed.

So, take it away Steve…

In the ever-evolving world of technology, amateur radio has remained a staple for communication enthusiasts worldwide. It's a hobby that transcends age, blending the allure of communication with the thrill of discovery and innovation. As we march into the future, a new technological ally has emerged for the amateur radio community: 3D printing. This convergence is not just about innovation; it's a testament to the boundless creativity and resourcefulness of ham radio enthusiasts.

A New Dimension of Customization

3D printing has transformed our approach to creating and customizing objects, offering ham radio operators the ability to design and fabricate parts, enclosures, and even antennas with remarkable precision and customization. Armed with a 3D printer, hobbyists can now produce components tailored to their specific requirements and the distinctive setups of their stations.

Cost-Effective Solutions and Repairs

One of the most significant advantages of integrating 3D printing into ham radio is the dramatic reduction in costs for repairs and upgrades. Rather than purchasing expensive replacements or scouring online for parts, operators can simply print what they need. This not only saves money but breathes new life into cherished equipment, reinforcing the ham radio tradition of DIY and experimentation.

Enhancing Antenna Design

Antenna design and construction is an area where 3D printing shines. Amateurs are experimenting with 3D-printed parts for antennas, including custom mounts and insulators. The ability to rapidly prototype and test different configurations without significant investment is a game-changer.

Educational Opportunities

The amalgamation of ham radio and 3D printing also serves as a fertile ground for educational ventures. Schools and clubs can harness these technologies to ignite a passion for STEM fields, offering students tangible learning experiences that bring theoretical concepts to life. This hands-on approach not only educates but also inspires the next wave of creators, engineers, and radio enthusiasts.

A Community of Innovators

Historically, the ham radio community has led the charge in technological innovation. The adoption of 3D printing is merely the latest testament to this enduring spirit of curiosity and pioneering. Online platforms are teeming with enthusiasts eager to exchange 3D printing insights, projects, and tips, nurturing a worldwide network of knowledge sharing.

Looking Forward

The fusion of ham radio and 3D printing promises endless possibilities, limited only by the imagination of the hobbyists themselves. Whether it's creating the perfect knob for a vintage transceiver, designing a custom case for portable operations, or just creating some specialize tools the interaction between ham radio and 3D printing is propelling the hobby into new and exciting territories. The intersection of ham radio and 3D printing is not just about the technology; it's about the community, the spirit of innovation, and the endless pursuit of knowledge. As we embrace these new tools and ideas, we continue the rich tradition of amateur radio, ensuring it remains a vibrant and dynamic hobby for generations to come.

Let’s embrace the melding of tradition and innovation by sharing our stories, projects, and successes. Your stories and projects not only inspire but also drive the community forward. I invite all enthusiasts to contribute their experiences with 3D printing, offering insights, guidance, and inspiration to others. Together, we're not just keeping up with the march of technology; we're leading the parade. ‘Til next time – Smile and Cruise

73,

~ Steve VE3EZB

March 2024 Newsletter of the Seaway Valley Amateur Radio Club - https://www.svarc.ca/

SARC SOCIETY DIRECTORS 2022-2023

PRESIDENT
Steve Mclean VE7SXM
president at ve7sar.net

VICE PRESIDENT
John Brodie VA7XB
vicepresident at ve7sar.net

SECRETARY / WEBMASTER
Mike Porisky VE7YEG
secretary at ve7sar.net

TREASURER
Scott Hawrelak VE7HA
treasurer at ve7sar.net

DIRECTORS

Andrew Elgin VA7LGN
andrew.elgin at gmail.com

Gord Kirk VA7GK
(SEPAR Liaison)
SEPAR at ve7sar.net

John Schouten VE7TI
(SARC Publications/Blog/Social Media & Courses)
communicator at ve7sar.net
course at ve7sar.net

Stan Williams VA7NF
flowbased at shaw.ca

SARC MEMBERSHIP, CONTEST & OUTGOING QSL MANAGER
John Brodie VA7XB
membership at ve7sar.net

SARC REPEATER MANAGER
Horace Bong VA7XHB
repeater at ve7sar.net

SARC NET MANAGER
Reg Natarajan VA7ZEB
net at ve7sar.net

A look back...

At The Communicator—September 2014

Past Communicators are available at:
https://ve7sar.blogspot.com/search/label/SARC%20Communicator
or search the complete Communicator contents & index at:
SARCindex

September & October

At SARC and SEPAR we get back into our schedule of activities.

Our general meeting on Wednesday, September 11 will have a presentation on the iCOM D-STAR system. This will be at the Surrey Fire Service Training Centre, 14923 64th Avenue at 7PM.

At our Wednesday, October 9th meeting, also at the Fire Training Centre, we will have a presentation from the high altitude ballooning team whose exploits you have read about on these pages. Adrian VE7NZ and Scott VE7SL will demonstrate their equipment and describe their launches.

Both should be very informative.

In November we plan to return to on-line meetings to avoid weather issues. Our next issue will have additional details.

SARC hosts an Amateur Radio net each Tuesday evening at 8 PM. Please tune in to the VE7RSC repeater at 147.360 MHz (+600 KHz) Tone=110.9, also accessible on IRLP node 1736 and Echolink node 496228. On UHF we operate a repeater on 443.775MHz (+5Mhz) Tone=110.9 or IRLP Node 1737.

We have a '**Get On The Air**' net directed at new hams on Thursday evenings at 8pm, on our 2m repeaters: North: 147.360MHz+ Tone=110.9Hz and South: 147.360MHz+ Tone=103.5Hz. Our SARC Elmers will be on hand to answer your questions.

Down The Log…

SARC Monthly Meetings

2nd Wed. (Sept-Jun)
1900 hrs at the Surrey Fire Service Training Centre, 14923 - 64 Avenue, Surrey, BC. Here is a what3words link and map: https://what3words.com/markers.addiction.ozone

Weekly SARC Social

Saturday between 0730 and 0930 hrs at the Denny's Restaurant, 6850 King George Blvd., Surrey BC

Workshops

Saturday between 1000 and Noon at the OTC 5756 142 Street, Surrey

SEPAR Net

Tuesday at 1930 hrs local on 147.360 MHz (+)
Tone=110.9

SARC Net

Tuesday at 2000 hrs local on 147.360 MHz (+)
Tone=110.9

VE7RSC Repeaters

2m North: 147.360MHz+
Tone=110.9Hz
IRLP node 1736
Echolink node 496228

2m South: 147.360MHz+
Tone=103.5Hz Fusion capable; No IRLP/EchoLink

1.2m: 223.960 Mhz -1.6
Tone=110.9Hz

70cm: 443.775MHz+
Tone= 110.9Hz
IRLP node 1737
WiRES-X Room ID 00047

We Have A SARC Patch!

These are suitable for sewing on a jacket, cap or your jammies, so you can proudly display your support for the club.

The price is $4 each or three for $10 and they can be picked up at a meeting or the weekly Koffee